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ROYAL BOTANIC GARDENS, KEW

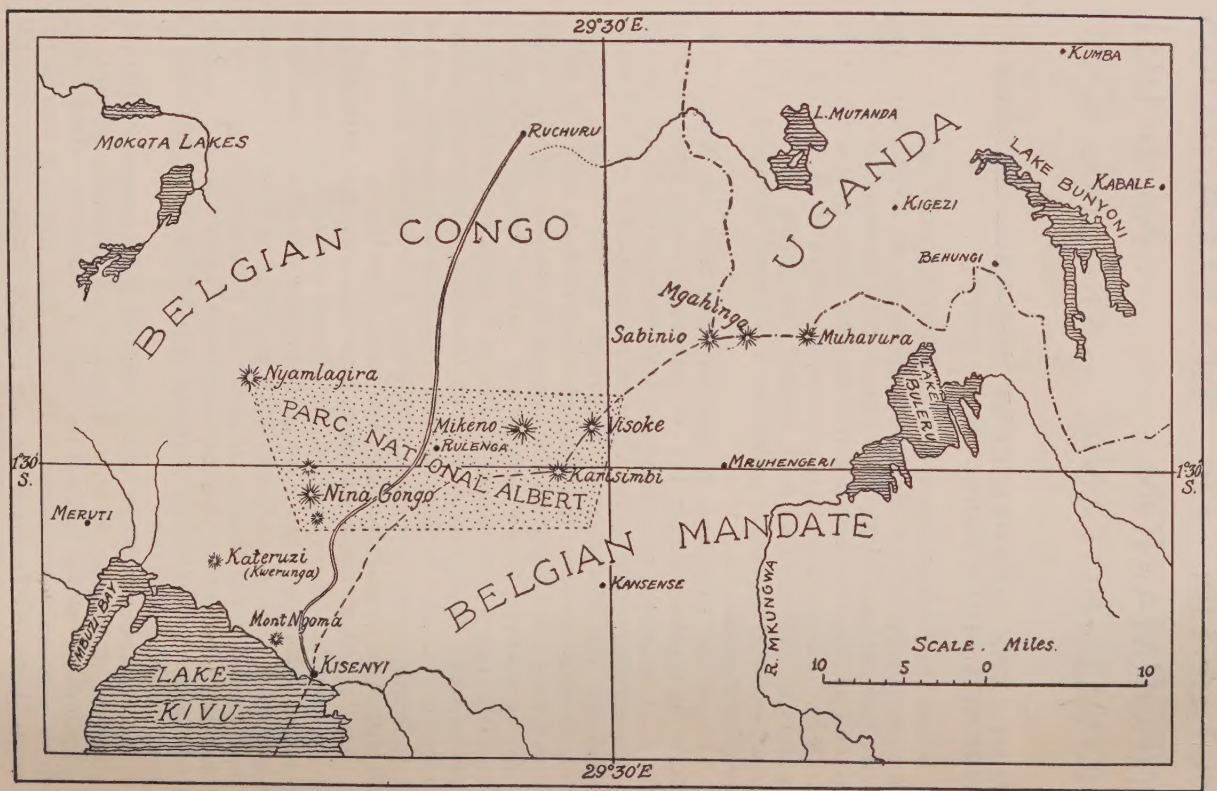
XLIII.—THE ARBORESCENT SENECIOS OF THE VIRUNGA MOUNTAINS. A. D. COTTON.

Since the original description by Oliver 47 years ago of a tree Senecio, discovered by Sir Harry Johnston on Kilimanjaro, not more than six gatherings of this remarkable group of plants, up to the end of 1929, had been received at Kew direct from collectors in the field. The publication of a new species in the *K.B.*, 1930, p. 97, appears to have aroused fresh interest, for during the last twelve months several important collections have been forwarded to Kew for identification.

Two of the gatherings in question were from Mt. Elgon, from Mr. H. M. Gardner and Mr. L. C. C. Liebenberg, and a third was from Mr. J. D. Snowden, who, during an expedition to the Kigezi District in the extreme south-west of Uganda, gathered a fine series of specimens on the mountain of Muhavura in the Virunga Range. Very valuable material has also been received from Mr. B. D. Burtt from Kilimanjaro and from the Virunga Mountains. Mr. Gardner's plant is possibly a new species and further material is desired. Mr. Liebenberg's specimen proved to be *S. elgonensis*, a little known species which, though often seen by travellers, is apparently represented in European herbaria by two collections only, namely that of R. A. Dummer (the type gathering), and of J. D. Snowden, both from Mt. Elgon on which it is endemic as far as is known.

Mr. Snowden's recent specimen from Muhavura proves to belong to an even less known species, the flowers of which had not been previously collected, the name of the species indeed having been based on a single leaf brought back by Dr. J. Mildbraed from the same group of mountains in 1907, and preserved in the Berlin Herbarium. The plant proves to be a most distinct species, and now that ample and flowering material is available it is desirable to complete the description.

The mountain of Muhavura is situated at the eastern end of the group of volcanoes in the Kingdom of Ruanda, known as "Mufumbiro" or the Virunga (or Birunga) Volcanoes. This region, which previously was partly in German East Africa, is now in the Congo Mandated Territory and the Belgian Congo, Muhavura, the particular summit ascended by Mr. Snowden, being on the boundary between the former territory and Uganda.


29°30'E.
KUMBA
L. MUTANDA
MOKOTA LAKES
RUCHURU
UGANDA
LAKE BUNYONI
KABALE
KIGEZI
BELGIAN CONGO
BEHUNGI
Mgahinga
Sabinio
Muhavura
Nyamlagira
LAKE BULERU
PARC NATIONAL ALBERT
Mikeno
RULENGA
Visoke
1°30' S.
MRUHENGERI
Kanisimbi
Nina Congo
MERUTI
BELGIAN MANDATE
Kateruzi (Kwerunga)
KANSENSE
Mont Mgomá
R. MKUNGWA
KISENYI
LAKE KIVU
SCALE. Miles.
10 5 0 10
29°30'E

The Virunga Mountains are of such exceptional interest that a statement as to their origin and importance will not be out of place. They form a range, including eight large volcanoes, which during tertiary times was thrown up across the floor of the western branch of the Great Rift Valley, namely the branch known as the Great Divide or the Tanganyika-Nile-Rift. The mountain-mass thus formed acts as a bridge across the deep fold which separates the grasslands of East Africa from the forests of Central Africa, and when the whole flora of Africa is more critically known a detailed study of this area should be worthy of special attention. These mighty eruptions are believed moreover to have formed a dam which separated the lakes of Albert Edward and Kivu, with the result that the waters of Lake Kivu now find their way to the Atlantic by way of Lake Tanganyika and the Congo River, instead of flowing through Lake Edward to the Nile and the Mediterranean.

The range consists of a western group of volcanoes, Nyamlagira,* 10,046 ft., and Nina Gongo, 11,386 ft.; a central group, Mikeno, 14,540 ft., Karisimbi, 14,780 ft., and Visoke, 12,175 ft., and an eastern group, Sabinio, 11,960 ft., Mgahinga, 11,400 ft., and Muhavura, 13,547 ft. Nyamlagira and Nina Gongo are still active. The western part of the area was established by the Belgian Government in 1925 as the Parc National Albert, mainly for the preservation of the gorilla. The preserved area includes part of Nyamlagira, Nina Gongo, Karisimbi, Mikeno and Visoke (see map).

There is little scientific literature on the Virunga Mountains available and the following references include all those of botanical interest which have been traced. Graf von Götzen's volume on the German Expedition across the African Continent in 1903-4 provides the first accurate and scientific treatise on the Lake Kivu area (1). The Expedition was mainly concerned with matters other than botany, but this subject was not disregarded. An enumeration of 81 plants, preserved in the Berlin Herbarium, is included (p. 241). Although arborescent Senecios are not listed von Götzen refers (*l.c.* p. 241) to them as forming a belt below the summit of the active volcano Nina Gongo, which he was the first to ascend, and a specimen (No. 115) is to be found in the herbarium at Berlin.

The small volume by Wollaston on the Expedition to Ruwenzori in 1905-6 and his journey across the Congo Free State (2), although containing but few references to plants, is worthy of notice by reason of the chapter dealing with Lake Kivu and the volcano range.

In 1907, the Duke of Mecklenburg led his first great scientific expedition across Africa, the party including a botanist (Dr. J. Mildbraed), zoologist, geologist, ethnologist, and bacteriologist. The general results are summarized in the volume entitled In the Heart of Africa (3). A most interesting account devoted entirely to the volcano region and illustrated with a fine series of photographs of the wonderful craters is contained in chapter vi, and a

* The spellings of mountains are in accordance with the paper by J. E. T. Philipps (17).

complete list of the plants collected is found in Mildbraed's treatise on the flora in the Wissenschaftliche Ergebnisse der Expedition (4). Two tree Senecios were recorded and were determined by Muschler, who dealt with the Compositae, as *S. Johnstonii* Oliver and *S. adnivalis* Stapf. In his later paper on the vegetation of the countries explored during the Expedition Mildbraed (5) devotes a section to the Virunga Volcanoes and summarizes and compares the vegetation of the four chief mountains Nina Gongo, Karisimbi, Sabinio and Muhavura (pp. 636-650), all of which he had ascended. He refers the species of *Senecio* on each mountain to the Ruwenzori plant, *S. adnivalis* Stapf. A similar account is found in the paper read before the Prussian Academy of Science (6).

The following extracts from the Duke of Mecklenburg's work are of interest as indicating the very extensive growth and development of these plants on the mountains in question. " The *Senecio Johnstonii* vegetation is extraordinarily developed on Karisimbi. It begins below the so-called south cone at an elevation of about 3400 metres as a candelabrum-branched tree about 10 metres in height, and extends up the cone for another 1000 metres, of which it is the sole inhabitant. . . Below the summit it gives way to mosses, liverworts, and lichens, but we come across it again near the highest point in the shape of a few dwarfed specimens amongst snowflakes and the storm-tossed lava fragments which were studded with ice crystals at an elevation of 4500 metres " (3, p. 159; see fig., p. 162). With reference to Muhavura, on which Mr. Snowden collected, it is stated that in places which have been spared by recent lava floods the *Senecio* vegetation at the summit is developed quite typically. The plants " form a belt-like zone, a real primaeval forest of such density and amidst such a jumble of timber covered with dripping wet moss cushions that one can only work through it with considerable difficulty, often sinking up to the breast in over-grown clefts and hollows " (3, p. 163-4). Notes are also given in the same volume of the development of tree Senecios on two of the other volcanoes, namely Karisimbi and Mikeno. A summary of the vegetation and flora of these mountains as far as was known up to 1910 was provided by Engler (7).

Theo Kassner, the geologist, visited the Kivu area and ascended Nina Gongo during his journey from South Africa to Egypt. In his account (8) published in 1911, there are brief notes on the flora and there are at Kew some of the plants collected on the lava beds around Lake Kivu.

Another German expedition to East Africa was organised in 1911 and Hans Meyer's account of this journey (9), published in 1913, includes two chapters (iii and iv) on the Ruanda country. The plant collections were worked out by Mildbraed and a list of species is provided in chapter ix. No tree Senecios are included. A paper on the vegetation by the same botanist was published a year later (10).

The Swedish Rhodesia-Congo Expedition of 1911-12 also visited the Virunga Mountains. In his treatise (11) on the botanical results Professor R. E. Fries, who accompanied the expedition and ascended the mountain of Nina Gongo, records *S. Johnstonii* (p. 335). An account of the vegetation of this mountain with further notes on the Senecios was published later (12).

During the smaller Swedish Expedition which visited Kenya and Uganda in 1921-22, Professor R. E. Fries and Dr. Th. C. E. Fries explored particularly Mt. Kenya and the Aberdare Mountains. Up to this date the few Giant Senecios which had reached European herbaria were referred to *S. Johnstonii, S. adnivalis,* or *S. keniensis* (which proved to be a *nomen confusum*). On their return the brothers Fries published their well-known paper "über die Riesen Senecionen" (13) in which six new species were described, including one from the Virunga region, which Prof. R. E. Fries and Dr. Mildbraed had collected in 1911 and 1907 respectively, and had referred to *S. Johnstonii.* To this plant they gave the name *S. Erici-Rosenii,* after Count Eric von Rosen, who was the leader of the 1911 Rhodesia-Congo Swedish Expedition.

Later in the same year Mildbraed published a paper on the African Tree Senecios (14) in which he referred to a second plant which he had collected on the Virunga Mountains and had regarded as a large form of *S. adnivalis* Stapf. This he described as *S. Erici-Rosenii* var. *alticola* var. nov. (p. 230). The new variety was distinguished by the extremely felty under-surface of the foliage, and was represented by a single leaf preserved in the Berlin Herbarium. The following year Dr. Th. C. E. Fries, working over the same material, raised this variety to specific rank, naming it *S. alticola* (15). Dr. Mildbraed has kindly sent this specimen on loan to Kew and it is found to agree precisely with the plant newly received from Mr. Snowden from Muhavura.

The results of the Swedish and two German Expeditions which visited the Virunga mountains are summarized by Engler in his Pflanzenwelt Afrikas (16). He draws largely on Mildbraed's work but adopts the name *S. Erici-Rosenii* (pp. 303-310).

The expedition of the Harvard Institute of Tropical Biology and Medicine to Liberia and the Congo during 1926-27 visited the Kivu area, and Dr. D. H. Linder, botanist to the Expedition, collected on the Virunga Mountains. The specimens were forwarded to Berlin for determination. No report on these plants has been published but the duplicates have been distributed and amongst them a specimen of *S. Erici-Rosenii* from Nina Gongo.

No other information of consequence has been published on the botany of this region, though casual references to plants are to be found in the works of Alexander Barns and others. A well-written general account of considerable interest was, however, published in 1923 by Captain J. E. T. Philipps entitled "Mufumbiro: The Birunga Volcanoes of Kigezi-Ruanda-Kivu" (17).

Appended are full descriptions of the two species, the first being modified from that supplied by Prof. R. E. and Dr. Th. Fries, and the second being provided for the first time.*

Senecio Erici-Rosenii *R. E. & Th. C. E. Fries* in Svensk Bot. Tidskrift xvi. p. 390 (1922).—*S. Johnstonii* et *S. adnivalis* auctorum pro parte (non Oliver nec Stapf).

Stem repeatedly forked, 2–10 metres high, covered below with a rough furrowed bark and above with the remains of the old leaves bearing large terminal rosettes of leaves. *Leaves* thin, broadly elliptic to oblong-elliptic, petiolate, dentate, entire or subentire towards apex, lamina 30–60 cm. long and 12–20 cm. broad, upper surface glabrous when mature; midrib more or less arachnoid-tomentose towards the insertion; lateral nerves distinct, about 1–1·3 cm. apart; lower surface arachnoid-tomentose at first, almost glabrous with age, midrib barbate-tomentose; petiole short, gradually passing into the lamina, narrowly winged, 2–6 cm. long, 2 cm. wide. *Inflorescence* bracteate, paniculate, up to 1 metre high, with flower heads subcorymbosely arranged on slender ascending lateral branches; main axis and branches arachnoid-tomentose becoming glabrous with age. *Flower-heads* subcampanulate, about 18 mm. wide (excluding ligules) and 15 mm. long, pedunculate. *Involucre* 3-seriate, outer bracts (involucel) linear, 10 mm. long; inner bracts 2-seriate, 12–14, narrowly lanceolate or lanceolate, acute, margin entire, subglabrous (or very rarely slightly pilose), puberulous at apex, 11–12 mm. long, 2–4 mm. wide. *Ray-flowers* few, ligulate, yellow; tube 6 mm. long, ligule 10–14 mm. long, 3-fid. *Disk-flowers* 50–60, 8 mm. long, tube cylindrical, anthers exserted. *Pappus* barbed with rough hairs.

Virunga Mountains. Nina Gongo, 12.6.94, *von Götzen* 115 (Herb. Berol.); *Mildbraed* 1421 (Herb. Berol.); *R. E. Fries* 1716 (Herb. Uppsal.); 16.2.27, *Linder* 2132; on upper zone of active cone, being killed by SO_2 fumes from crater, 11,000 ft., 7.1.31, *B. D. Burtt* 3180; in extinct southern crater especially on north side, 9000 ft., 8.1.31, *B. D. Burtt* 3187. Muhavura, 11,500 ft., 7.12.30, *B. D. Burtt* 2824. Mgahinga, on crater, 11,400 ft., 10.12.30, *B. D. Burtt* 2844. Sabinio, summit, 11,900 ft., 12.12.30, *B. D. Burtt* 2966. Visoke, in

*Since the above account was written a magnificent collection of Senecios from the mountains of the Virunga Range has been received from Mr. B. D. Burtt. He reports that these plants occur on seven out of the eight great mountain summits and are absent only on the very active volcano Nyamlagira. The two species inhabit two distinct altitudinal zones, which slightly overlap. *S. Erici-Rosenii* occurs between levels of 9500 and 11,500 ft. and is found on all the volcanoes except Nyamlagira. *S. alticola*, which occurs in a zone extending from 11,000–13,500 ft. was found only on Muhavura, Visoke, Mikeno and Karisimbi. It may be regarded as absent on the other four mountains. Mr. Burtt reports that he saw no evidence of the occurrence of "cabbage forms" such as occur on Mt. Kenya. His specimens are cited below under their respective names, but a general account of their occurrence and distribution on the individual mountains will be published later by Mr. Burtt.

Hypericum lanceolatum forest, 10,500 ft., 15.12.30, *B. D. Burtt* 3009. Karisimbi, in *Philippia* forest on southern slope, 9500–11,000 ft., 27.12.30, *B. D. Burtt* 3089.

This species is distinguished from *S. alticola* by its thin leaves, which except for the midrib are in the mature state almost or quite glabrous on the underside, and when in flower by the larger inflorescence and well developed ray florets. It forms a zone between 9000–11,500 ft., and thus usually is mainly below the cloud belt. It may occur in pure communities or at lower levels be associated with *Philippia Johnstonii, Hypericum lanceolatum,* and *Hagenia abyssinica.* Its occurrence either in the open or in the shelter of forest gives it much greater range of size than *S. alticola.* It is on the whole a much taller plant and more copiously branched. In the forest it is usually about 12–15 ft. high, but in very sheltered ravines old plants may assume the proportions of much-branched trees, some specimens of 30 ft. high having been noted (Burtt).

Though the two species are very distinct, occasional plants are met with which are intermediate with regard to certain characters, notably in the pubescence on the under side of the leaves. From the fact that the *S. Erici-Rosenii* zone overlaps the zone of *S. alticola* it would appear that the occasional presence of intermediate forms could not be used in support of the view that the latter species is a high altitudinal form of the former, but would rather suggest that the non-typical individuals found locally may represent hybrids or segregates from hybrids.

S. Erici-Rosenii is the species which was previously referred to in the literature as *S. Johnstonii* Oliver and as *S. adnivalis* Stapf. It has been noted by all explorers as growing in profusion at about 10,000 ft. on Nina Gongo and on other summits in the Virunga Mountains. It is very distinct from *S. Johnstonii* but is undoubtedly allied to *S. adnivalis* from Ruwenzori. In the present state of our knowledge, however, it must be maintained as a distinct species on account of the longer ligules of the ray-flowers. The recently described species *S. longeligulata* De Wild., also from Ruwenzori, is obviously very nearly allied to *S. Erici-Rosenii* and possibly identical with it.

Senecio alticola *Th. Fries* in Svensk Bot. Tidskrift xvii. 229 (1923). —*S. Erici-Roseni* var. *alticola* Mildbr. in Fedde Rep. xviii. 230 (1922); ab omnibus speciebus sectionis foliis subtus indumento albo-griseo longo villosis differt.

Stem simple or repeatedly forked, up to 2 metres in height, with terminal rosette of leaves. *Leaves* coriaceous, obovate-oblanceolate, petiolate, irregularly dentate with triangular teeth 2–4 mm. long, lamina 30–50 cm. long, 15–20 cm. broad, upper surface glabrous when mature and faintly reticulate, lower surface covered with a persistent, dense, shaggy, white to grey-white indumentum; midrib very marked, continuing to apex, lateral nerves distinct, 1–1·4 cm. distant, forking and anastomosing towards the margin; petiole

winged, short, up to 6 cm. long, 2–3 cm. wide, clothed on both surfaces with abundant, long, silky, grey-white hairs. *Inflorescence* bracteate, paniculate, less than 1 metre high, densely crowded with flower heads subracemosely arranged on short, spreading, lateral branches; main axis and branches clothed with very dense, long, woolly indumentum; lower bracts leaf-like, upper bracts slightly purple. *Flower heads* widely campanulate about 3 cm. wide, 1·5 cm. long, shortly pedunculate; flowers yellow. *Involucre* 3-seriate; outer bracts (involucel) linear, 15–16 mm. long, 1 mm. wide; the inner 2-seriate, oblong-lanceolate, acute, 16–17 mm. long, 4–5 mm. wide, glabrous, tips shortly ciliate, purplish when dry. *Ray-flowers* few, shortly ligulate, inconspicuous, yellow; tube about 7–8 mm. long, ligule linear-oblong, 5–6 mm. long, apex 2–3 fid. *Disk-flowers* very numerous, about 160, 10–12 mm. long, tube cylindrical below slightly inflated above, anthers slightly exserted; achenes about 3 mm. long, striate, glabrous. *Pappus* barbed, about 1 cm. long.

Virunga Mountains. Karisimbi, "von oberen Grenze auf Hauptkegel," Nov. 1907, *Mildbraed* 1609; on upper slopes 1200–1300 ft., dominant shrub, 27.12.30, *B. D. Burtt* 3098. Muhavura summit, 13,500 ft., 19.11.29, *Snowden* 1555; summit, 13,500 ft., 6.12.30, *B. D. Burtt* 2797, 2811, 2812. Visoke, in crater on summit, 12,100 ft., 15.12.30, *B. D. Burtt* 3012, 3013. Mikeno, on southern slopes, dominant shrub, 11,500 ft., 25.12.30, *B. D. Burtt* 3067, 3068, 3069, 3070, 3071; on precipitous southern slopes near summit, 14,000 ft., 25.12.30, *B. D. Burtt* 3072, 3073, 3080.

Senecio alticola, which grows above the forest belt and in more exposed conditions, is a shorter, sturdier plant than *S. Erici-Rosenii* and more uniform in size. It is seldom more than 10 feet high, but even at the highest altitudes may branch four or five times. It is distinguished at a glance from *S. Erici-Rosenii* by the dense white woolly tomentum on the under-surface of the leaf. (See also notes under that species.)

Mr. Snowden pointed out that this species extended on Muhavura from about 11,500 ft. to the extreme limit of phanerogamic vegetation, namely at about 13,500 ft. This fact has been confirmed for other mountains by Mr. Burtt, who states that it usually appears suddenly in the vegetation, and shows up at once by the white underside of the leaves. He further observed that it occurs chiefly on the southern and more exposed slopes of the mountains and is associated with *Lobelia Wollastonii*.

The character of the tomentum in this species is different from that found in any other arborescent *Senecio*, and in this respect it stands in an isolated position in the genus.

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XLIV.—A NOTE ON MUSA ORNATA. E. E. Cheesman.

In standard works, including Hooker's Flora of British India, Species and Principal Varieties of Musa (*Kew Bulletin* 1894, 229), and Das Pflanzenreich, *M. ornata* Roxb. is given as a synonym of *M. rosacea* Jacq. I was recently able, by the courtesy of the Director of the Royal Botanic Gardens, Kew, to examine certain literature and coloured plates in the Herbarium, which show very clearly that this synonymy is erroneous, and as considerable confusion has already been caused by the mistake, it appears desirable to publish the facts.

M. rosacea Jacq. is illustrated in his Fragmenta Botanica t. 132, fig. 4, and Hort. Schoen. t. 445. The first figure shows a "hand" of four fruits, each about four inches long by one and a quarter inches broad, slightly angled, and of a pinkish or "old rose" tint. The second shows the male bud, with dark purple bracts, of which several are lifted at once, and the male flowers, which are also pink.

Figures in Loddiges' Cabinet t. 615 and Botanical Register t. 706, given as *M. rosacea* Jacq., are quite different from those cited above, but both agree with another plate in the Kew Herbarium marked "*M. ornata*, Icones Roxburghianae," which I take as an authentic figure of *M. ornata* Roxb.

It is therefore quite evident that two species are involved. The authentic figures of *M. rosacea* Jacq. agree exactly with no species known to me or described in the literature, but I incline to believe that they represent a form referable as a variety to *M. sapientum* L.

The figure of *M. ornata*, on the other hand, represents very accurately a species which is in the Imperial College of Tropical Agriculture collection under two numbers, one obtained from the Royal Botanic Gardens, Port of Spain, without a name, and the other from Java as " M. rosacea." Furthermore, it agrees with the description and coloured plates in the Journal of the New York Botanical Garden 27, 1926, Pl. 301 and 302, of a plant found by Bassier in Peru and doubtfully named by him "*Musa coccinea* Andr. (?)," and also with a photograph of a plant in Surinam, given by d'Angremond in Flora, 1914, Bd. 107, Taf. XI., as " M. ornata chittagong." Illustrations in the Kew collection from Mauritius and Principe equally clearly represent the same form, and I have seen the plant also in Jamaica under the name "*M. rosea*."

Thus, whilst *M. rosacea* Jacq. seems to be a doubtful species, *M. ornata* Roxb. has become widely disseminated, and it is the more important on this account that it should be correctly named.

The confusion appears to date from the Botanical Register, where accompanying t. 706 is text from which the following is extracted :—

" Musa rosacea. Mauritius Plantain Tree. There is some difference in the representation of this plant in Jacquin's work from the one before us, but we really believe the apparent difference arises principally from the upper portion of Jacquin's plant being withered before opening. An accident prevented our being able to examine the subject so accurately as we wished. The species has been called *rosacea* by Jacquin, not from the colour of the spathe, but from the form into which the valves of the spathe expand at the upper withered end in his sample . . . Introduced from the Mauritius by Sir Joseph Banks in 1805."

Comment may be made on this that I see no evidence of withered material in Jacquin's plate. The " form into which the valves of the spathe expand " may often be seen in the field on bananas of the *M. sapientum* affinity. Jacquin probably took the specific name from the pink flush on the male flowers, and/or the fruit. He certainly cannot have taken it from the bract colour, but on the other hand, the bract colour of *M. ornata* (pink) has probably assisted in the persistence of the mistaken synonymy.

D'Angremond (loc. cit. p. 63) detected the error in 1914, for he states of his plant—" Ich kann nur ausdrücklich betonen, dass sie *nicht* Musa rosacea Jacq. Fragm. ist." Also, it must be mentioned that several plates in the Kew collection marked *M. rosacea* have been altered to read *M. ornata* by some other person who must have noticed the discrepancy, but it still seems desirable to give the correction wider publicity.

PLATE VI

Musa ornata.

Imperial College of Tropical Agriculture. Feb., 1931.

[*To face page* 298.

PLATE VII

Musa ornata.

Imperial College of Tropical Agriculture.
Feb., 1931.

To face page 299.]

An interesting side issue of the matter is the fact that it affects the recorded parentage of the hybrid Musa described in the Gardeners' Chronicle (1895) as *Musa kewensis* ×. This hybrid is stated to be a cross between *M. Mannii* and *M. rosacea*. Inspection of the drawing there referred to leaves no doubt that "*M. rosacea*" is, in that case, again used incorrectly for *M. ornata*. *Musa kewensis* is itself, in the coloured drawing, extraordinarily like *M. ornata*, and the only clear evidence of the influence of *M. Mannii* is a splash of red pigment on the peduncle, which in *M. ornata*, so far as my observations go, is always green.

XLV.—SOME PERSIAN DRUGS. David Hooper.

The drugs described in the present article were nearly all collected in the bazaars of Teheran, Hamadan and Kirmandshah by Dr. J. M. Cowan and Dr. C. D. Darlington in the spring of 1929. An account of the tour is given in *Kew Bulletin* 1930, pp. 49-68, by Dr. Cowan in a paper "A Botanical Expedition to Persia." The drugs were all of a vegetable origin and have been identified at Kew with the assistance of the staff of the Herbarium and Museums. A few specimens included in the list are from collections made during the past five years by Mr. B. Gilliat-Smith, British Consul at Tabriz.

It is of great interest to have an opportunity of studying the origin of these drugs, and comparing them with the names of those found in ancient literature of Persia where materia medica has long been a special science. The most important of the Persian works on pharmacology is the Kitabulabnyat an haqa 'iq-uladviyat, or "Book of the Foundations of the True Properties of the Remedies," written about A.D. 970 by the physician Abu Mansur, who during one of his journeys visited India. B. Laufer (Sino-Iranica, 1919) says "This is not only the earliest Persian work on the subject but the oldest production in prose of the Neo-Persian literature. The text has been examined by R. Seligmann from a unique manuscript of Vienna dated 1055, the oldest extant Persian manuscript." There is a translation by Abdul-Chaliq Achundow from Baku. This has been rendered into German and published by Dr. R. Kobert in his "Historische: Die pharmacologischen Grundsatze des Abu Mansur Muwaffak, 1893." References to this work are noted under the name "Achundow."

In the year 1681 there was published in Paris the "Pharmacopoeia Persica, ex idiomate Persico in Latinum conversa, opus missionariis, mercatoribus, caeterisque Regionum Orientalium, Lustratoribus necessarium nec non Europaeis Nationibus perutile." This was written by a Carmelite monk, Frater Angelus. There is a short list of a few raw drugs, but the work contains chiefly prescriptions for pharmaceutical preparations, many of which are made up of 15 to 20 ingredients.

A valuable work of more recent date is one published in Teheran in 1874. It was compiled by Prof. J. L. Schlimmer, of the Polytechnic

College of Persia, Chief Medical Officer to the Persian Army, and Sanitary Officer, Teheran. It is written in French, and entitled " Terminologie Médico-Pharmaceutique et Anthropologique Française-Persane." This contains a very full list of medicinal plants of Persia with identifications made by Boissier, the De Candolles, Haussknecht and other eminent European botanists and pharmacologists.

Dr. J. E. T. Aitchison has botanically explored portions of Persia and the neighbouring regions, and his " Notes on the Products of Western Afghanistan and of North-Eastern Persia," published in Edinburgh in 1890, has been most useful for reference. Dr. William Dymock, for many years Medical Storekeeper for Bombay, had exceptional opportunities of studying the drugs coming into India from the Persian Gulf, and his great knowledge of oriental languages in addition to his medical and botanical training placed him in the front rank of Indian pharmacognosists. His " Vegetable Materia Medica of Western India " (1885), and later, his " Pharmacographia Indica," are storehouses of information on the trade, natural history and composition of oriental drugs. Use has also been made of the " Flora of Syria, Palestine and Sinai " by Rev. G. E. Post (1896), Boissier's " Flora Orientalis," and " A working list of the Flowering Plants of Baluchistan," by Mr. I. H. Burkill (1909). Notes made by Dr. Cowan on the medicinal properties of the drugs are indicated by (C).

Many useful notes on drugs and Persian and Turki names of North Persian plants occur in a series of Articles by B. Gilliat-Smith and W. B. Turrill in *K.B.* 1930, Nos. 7-10, entitled " On the Flora of the Nearer East : A contribution to our knowledge of the Flora of Azerbaidjan, North Persia."

As a practical result of these determinations the Empire Marketing Board desire to know if any of these products could provide new therapeutic agents for employment in western medical science. From a consideration of the list of 150 drugs it will be seen that most of them were mentioned by Abu Mansur one thousand years ago ; several of them were prescribed by Avicenna and Dioscorides centuries before. It would seem that the drug supplies of this country, like the laws of the Medes and Persians, are unchangeable. The few products not mentioned by previous writers do not appear to have important properties ; they include the thistle-down of a *Cirsium*, the fruits of a *Gaillardia*, the flowers of a *Stachys*, the stems of a *Linum*, and the seeds of a *Chenopodium*. " The Iranians were the great mediators between the West and the East, conveying the heritage of Hellenistic ideas to Central and Eastern Asia, and transmitting valuable plants and goods of China to the Mediterranean area " (B. Laufer). The standard drugs of Persia, such as tragacanth and the fragrant umbelliferous gum-resins, are in constant demand, and the trade in others may be increased as their virtues become more widely known. It should

be remarked that the specimens examined in the present enquiry were in a fresh condition and free from any fraudulent admixture. If further quantities should be required for chemical or physiological examination it would be easy to obtain them from the markets of Teheran and Hamadan.

Literature cited.

Achundow		See Introduction.
Ait.	=	Notes on the products of W. Afghanistan and of N. E. Persia, by J. E. T. Aitchison (1890).
Boiss.	=	Boissier, Flora Orientalis.
B.P.	=	British Pharmacopoeia (1914).
Colloquios		by Garcia da Orta, Markham (1913).
Fl. Br. Ind.	=	Flora of British India.
Gild. & Hoff.	=	Volatile Oils, by Gildmeister and Hoffmann (1922).
I.H.B.	=	Baluchistan Plants, by I. H. Burkill (1909).
Laufer	=	Sino-Iranica (1919).
Makhzan-el-Adwiya		1769, reprinted 1824.
Ph. Ind.	=	Pharmacographia Indica (1891).
Ph. Pers.	=	Pharmacopoeia Persica (1681).
Pharm. Journ.	=	Pharmaceutical Journal.
Pharmacog.	=	Pharmacographia, by Flückiger & Hanbury (1874).
Post	=	Flora of Syria, Palestine & Sinai (1896).
Schl.	=	Schlimmer's Terminologie (1874).
Sci. Pa.	=	Science Papers, by D. Hanbury (1876).
Tschirch	=	Handbuch der Pharmakognosie (1912).
Wehmer	=	Pflanzenstoffe (1919).
Wiesner	=	Die Rohstoffe des Pflanzenreichs, ed. 4 (1927).
Y. B. Pharm.	=	Year Book of Pharmacy.

Abbreviations of Languages cited.

Arab.	=	Arabic.	Hind.	=	Hindustani.
Bal.	=	Baluchistan.	Lat.	=	Latin.
Beng.	=	Bengal.	Pers.	=	Persian.
Bom.	=	Bombay.	Port.	=	Portuguese.
Fr.	=	French.	Sans.	=	Sanskrit.
Gr.	=	Greek.	Syr.	=	Syrian.
Guz.	=	Guzerati.	Turki	=	Turki.

Abrus precatorius *Linn.* (Leguminosae). The seeds.

Ain-el-dik, "Cock's eye" (Hamadan); Echechme khorouce (Schl.); Jequirity; Paternoster Seed; Indian wild liquorice.

Schl.; Fl. Br. Ind. ii. 175; Ph. Ind. i. 430.

The plant grows in India and is cosmopolitan in the tropics; the seeds are exported from India to Persia and other countries in the west. The well-known scarlet seeds, with a black spot at one

end, are made into necklaces and rosaries. They were formerly used as a standard weight by goldsmiths, the average weight of the seeds being 1·7 grains. The leaves and root contain a sugar (D. Hooper, Pharm. Journ. 1894, 937).

In medicine the seeds are said to have hilarant properties, and in Persia they are classified among the poisons. In India toxicological enquiries have shown that the seeds are ground into a paste, the paste is made into suis or needles, and these are inserted hypodermically in the bodies of cattle and bring about their death. Drs. Warden and Waddell in 1884 separated a protein body, called abrin, which is the active principle. Spica in 1888 called it a glucoside. Sidney Martin in 1889 found it to be a globulin or albumose. In 1891 Kobert described it as a toxalbumin.

Achillea Santolina *Linn.* (Compositae). Flowering tops.

Būmādrān (Teheran); Boi mazandran; Bui madaran (Pers.); Boe madran (Bal.); Birinjasaf (Ind. bazaars).

Ait. mss.; I.H.B.; Schl.; Boiss. ii. 266; Ph. Ind. ii. 272.

The dried herb with flower-heads sold in Teheran is collected about Senneh and the surrounding hills (C). The plant is widely distributed in the East and in Northern Africa. The flowers are arranged in corymbs. The heads are 5 mm. high and 3 mm. in diameter, the tubular flowers are yellow, and the involucres are covered with grey tomentose scales. They have a pleasant aroma. The flowering heads are used as a tonic and carminative in Persia and Sind. The strong odour of the herb drives away fleas and other noxious insects. In Baluchistan the drug is given to children for colic. Dymock says the Common Yarrow (*A. Millefolium* L.), growing in India, goes by the same name and has similar properties.

Adiantum Capillus-Veneris *Linn.* (Filices). The fern.

Kashburat (Teheran); Kashburat-el-bir, "Coriander of the wall" (Pers.); Pousia wechame (Schl.); Parsia washan (Pers.); Barr-i-sija waschan (Achundow 163); Kansburaj, Moohar-khas (Ind. bazaars).

Ait.; Post; Schl.; Ph. Ind. iii. 624.

The maiden-hair fern is found in Persia, Afghanistan, the North-Western Himalayas and Western China, but other species of fern are used medicinally and are called by similar names. The drug is said to be collected from walls around Teheran. The rhizome is the part used in medicine; it is credited with expectorant properties and is given for relieving difficult respiration.

Allium sativum *Linn.* (Liliaceae). The seeds.

Tukhm-i-tarra (Teheran, tarra—Persian for pot-herb). Garlic. Boiss. v. 229.

Under this name the small black, angular, corrugated seeds of an Allium are sold in Teheran. They are probably the seeds of the Garlic, which is *par excellence* the pot-herb of the East. Three kinds

of the plant are grown in Persia; Bustani (garden), Bari (wild), and Kirathi (leek-like).

Althaea lavateraefolia *DC.* (Malvaceae). The root.

Risha-i-khatmi (Hamadan); Rishah-i-khitmi (Ind.); Tibetche khetme (Schl.); Khutmi (Post).

Achundow; Schl.; Boiss. i. 828; Post; Ait.; I.H.B.

This plant grows in Egypt, Persia and Afghanistan. Aitchison says it is cultivated in North-Eastern Persia, not only for the showiness of its flowers, but for its petals, which are collected as they fall off the plant and are called gul-i-khatmi, and the seeds tukhm-i-khaira. In Baluchistan the flowers of *A. pallida* Wall. are called gul-i-khaira. The root, seeds, and flowers of these malvaceous plants are all used in medicine and are occasionally exported. The root from Hamadan agrees with that of *L. lavateraefolia*, but Achundow refers the drug to *A. ficifolia* Cav. and Schlimmer to *A. officinalis* Linn. The root is fibrous, light-coloured, and becomes mucilaginous when soaked in water. It is considered strengthening. It is probably a Persian substitute for the root of the Marshmallow of Europe (*Althaea officinalis*).

Alyssum campestre *Linn.* (Cruciferae). The seeds.

Hodame (Teheran); Qodumah (Pers.); Ghodaoumehe chirazi, Touderi, Djensidge (Schl.); Hedge Garlic; *Erysimum officinale* = *Sisymbrium officinale* in Schlimmer's Terminologie.

The seeds are light-brown, lens-shaped, 2 by 1·5 mm., with yellowish-grey border; they become coated with semi-opaque mucilage when placed in water. Preparations of the seeds are given in chest complaints (C).

Anethum graveolens *Linn.* (Umbelliferae). The fruits.

Shua, shuvit (Pers.); Sowa (Hind.); Suva, shepu (Bom.); Shibbit (Arab.); Anitum (Yunani); Dill seed.

Dill is a pot-herb in Persia, and the fruits are sold in the bazaars and used as a carminative.

Anthemis Wiedemanniana *F. & M.* (Compositae). Flowerheads.

Gul-i-banoi (Hamadan); Banoi, probably a contraction of Bābūna or Babunij, a name for the chamomile and other fragrant medicinal composites used in the East. Babunah is a village in Arabia, where *Matricaria Chamomilla* was once abundant.

Achundow; Ait.; Post; Schl.; Boiss. ii. 286; Pharmacographia 346; Ph. Ind. ii. 275; I.H.B.

Schlimmer refers Babuneh shirazi to the Roman Chamomile (*A. nobilis*), and says it is cultivated on a large scale in gardens, and is administered, as in Europe, for its tonic qualities. Post attributes Babunij to *Achillea fragrantissima* Forsk. and *Matricaria aurea* Linn.; the latter is a fragrant plant, an infusion of which is used as a febrifuge and carminative.

The chamomiles of the Indian Bazaars, which are brought from Persia and known as Babunah, are the flowers of *M. suaveolens* L., a slender form of *M. Chamomilla* growing in South Russia, Persia, and Siberia. In Baluchistan *A. Gayana* Boiss. and *A. odontostephanus* Boiss. are used medicinally. Out of 93 species of *Anthemis* enumerated in Flora Orientalis Wiedemann's Chamomile of Syria, Asia Minor, and Persia, affords the drug in the Hamadan bazaar. The flower-heads are recognised by their small size (1 cm. across), the conical receptacle, and carinate palea ; they are bitter and have an agreeable fragrance.

Arctium Lappa *Linn.* (Compositae). The root.

Bardane (Teheran) ; Semen Bardanae (English Herbal 1730).

The Burdock plant is found in Syria, Persia, and Khorasan, as well as in Europe. The root under the name of Risha Baba Adam or " Root of Father Adam " is quoted in Schlimmer's ' Terminologie.' It is regarded throughout India as depurative and antiphlogistic. In Teheran the root, with that of sarsaparilla, is used as a remedy for syphilis. The drug has had a considerable reputation in ancient times, but from a chemical examination by Zellner (1924) there is no indication of any substance in the root being physiologically active.

Aristolochia longa *Linn.* (Aristolochiaceae). The root.

Zarawand (Hamadan) ; Zarawand-i-tawil (Pers.) ; Zirawande thewile (Schl.).

Achundow ; Schl. ; Ph. Pers. ; Post ; Ph. Ind. iii. 165.

The roots of this and other species of Birthwort are highly valued medicines in the East. The drug from Hamadan is the cylindrical root, 13 mm. in diameter, showing in section the peculiar wedge-shaped bundles of the wood. It has a somewhat bitter taste. The Aristolochias are stimulating tonics and are often given for snake bites. Locally the root is used for amenorrhoea and as a pectoral and stomachic.

Artemisia maritima *Linn.* (Compositae). Flower-heads.

Dharmane (Teheran) ; Darmanah (Pers.) ; Afsatin el bahr (Arab.). Ph. Ind. ii. 288 ; Greenish and Maplethorpe, Y.B. Pharm. 1923, 646.

Aitchison states that *A. maritima* and *A. campestris* exist everywhere in N.E. Persia over the dry and stony country, forming the chief fodder for cattle. Camels and donkeys thrive on them. The root-stocks and dry stems are the mainstay of the traveller for fuel. The flower-heads are collected from the villages around Teheran and sold as a vermifuge. The Indian supplies come from Afghanistan and Persia. The local product was used by Dr. Sayed during the war, when santonin could not be procured in Teheran, and both seeds and leaves were found effective. A mixture of Dharmane and Absinthe is said to be much more active than flowers of *Artemisia* alone. L. Simonsen examined the leaves and flowering tops of *A. maritima* (*A. brevifolia* Wall.) growing in Chitral, Afghanistan, and Baluchistan, and found from 0 to 1 per cent. of santonin.

There is more in the herb when the flowers are just appearing (Pharm. Journ. 1923 : 4, 57–63). Levant wormseed of European commerce comes from Persia and Asia Minor. It is also collected from a variable plant in the Himalayas, Kashmir, and Western Tibet.

Artemisia vulgaris *Linn.* (Compositae). Flower heads and leaves.

Absint (Teheran) ; Absentin (Pers.) ; Afsantin or Absanthin (Ait.) ; Afsintin roumi (Schl.).

Ph. Ind. ii. 284.

The origin of this ancient drug, described by Mohammedan physicians, is probably *A. Absinthium* Linn., but no doubt other species are used, including *A. vulgaris* and its varieties. *A. ponticum* Linn. is quoted by Schlimmer as the source of the drug sold in his day in Teheran ; this is a plant growing in Europe, the Caucasian region, and Songaria. Achundow states that the Persian drug is obtained from Roman, Indian, and Nabatean sources. *A. Sieversiana* Willd. is one of the Indian kinds of afsantin said to be imported from Persia. The sample of afsantin from Teheran is a mixture of flower-heads, stalks, leaves, and mineral impurities. It is used as a tonic and is regarded as a very efficient vermifuge. The Persian name of these plants has been given to absinthe, a well-known liqueur used on the Continent.

Asparagus adscendens *Roxb.*, and other species. (Liliaceae). The root.

Khushak (Hamadan) ; Kushak, merchubeh (Pers.) ; Isferaj (Ar.) ; Satavar, Satar mul, Shakakula micari (Hind.) ; Sufed musli of commerce (Bom.).

Ait. ; Schl. ; Post ; Boiss. v. 339 ; Ph. Ind. iii. 482.

The roots of several species of *Asparagus* are used in the East in medicine. Besides the above species, found in Afghanistan and Persia, *A. sarmentosus* Willd., *A. officinalis* Linn. and *A. racemosus* Willd. have been identified as the origin of some of these drugs from India. The fruits are also medicinal and are sold in the bazaars under the Arabic name Haliyun. The root from Hamadan is in long thin pieces, 2–3 mm. in diameter, ivory-white, hard, horny, wrinkled longitudinally, and somewhat twisted. It swells in water and becomes mucilaginous ; it has a mawkish, sweet taste, and hardly any odour. The root is considered to have stimulant and diaphoretic properties.

Asperugo procumbens *Linn.* (Boraginaceae). The flowers.

Badranj-boia (Teheran) ; Badrandj buya (Pers.).

Schl. ; Boiss. iv. 275 ; Post, 540 ; I.H.B.

This is a prostrate herb in Arabia, Persia, Afghanistan, Baluchistan, Europe, and North Africa. It is common in cultivated fields and gardens. The fruiting calyx is reticulate-veined with acute, ciliate lobes ; the pedicels are bent, the nutlets are oval, flat and warty.

The substitution of this plant for the well-known fragrant drug Badrandj-boia still persists in Persia. Schlimmer, writing under *Asperugo*, says " This plant, dried, is sold by the druggists of Teheran under the false name of Badrendj-bou-yeh, which is the true name of *Melissa cedronella*. I have never been able to understand the reason of this sophistication, to which Dr. Haussknecht was the first to call attention, because the true *Melissa* is largely cultivated in the gardens around Teheran." See *Dracocephalum Moldavica* (p. 315).

Astragalus fasciculaefolius *Boiss.* (Leguminosae). The gum.

Kundjida (Teheran); Kunjad, Gujar (Bomb.); Khunjada, " resin for bleeding," (Ait.); Anzarut (Arab.); Sarcocolla, " flesh glue " (Greek); Kohl Farsi=Persian Collyrium, Kohl Kirmani=Kirman Collyrium.

Ait. 18; Ph. Ind. i. 476; D. Hooper, Journ. As. Soc. Bengal, Vol. ix. No. 4, April 1913, pp. 177-181; Achundow; Schl.; Boiss. ii. 396.

This is a sweet exudation secreted by the above plant obtained from Kurdistan and exported to India and elsewhere. It occurs in pale yellowish-brown fragments, brittle in consistency, soluble in water and alcohol, with a sweetish taste and odourless. It contains a sweetish principle similar to glycyrrhizin.

Sarcocolla forms a plaster long used by Parsi bone-setters, and is applied locally to the ears and face to allay neuralgic pains. Aitchison says the gum is used by ladies of the harem to improve their appearance and to give the skin a gloss.

Berberis vulgaris *Linn.*, and other species. (Berberidaceae). The fruits.

Zirishk (Hamadan); Zarishk (Pers., Hind., Bom.); Zerechke (Schl.); Karoskai (Bal.).

Achundow; Ait.; Schl.; Boiss. i. 103; Ph. Ind. i. 65.

The Barberry is a common shrub growing at altitudes of 2000 ft. and upwards. The fruit is largely collected and consumed locally. It is also exported in quantity to India, where it is highly appreciated as a condiment. Dr. Cowan noticed *B. densiflora* Boiss. occurring in the North West of Persia, with broader berries than those of *B. vulgaris*; the fruits of both species are made into jam. In the Punjab the fruit and preserve is called Zirishk-tursh, to distinguish it in the trade from the small, dried, black grapes, known in Europe as currants or corinths (Aitchison).

The fruits (berries) are oblong, with an acid pulp and oblong seed. They contain dextrose, laevulose, and gum, and the unripe fruits contain berberine. Their consumption is said to remove itch and other skin complaints.

Calamintha graveolens *Benth.* (Labiatae). The seeds.

Ferenghi meak (Teheran); Frendje meehke (=*Melissa Calaminta*, Schl.); Faranj mishk or Biranj mishk (Arabic form of the Persian name); Palang mishk, which Dr. Dymock refers to *Ocimum*

sanctum Linn. (Ph. Ind. iii. 90). Pelenquemecke is referred by Schlimmer to another labiate, *Dracocephalum Kotschyi*.

Boiss. iv. 583 ; Post, 624.

This species of Calamint frequents the Mediterranean region, Syria, Asia Minor, Iraq, and the Transcaucasus. The seeds from Teheran are said to be brought from Shiraz ; they were grown at Kew and identified as above. The drug is known in India, where supplies come from Persia.

The seeds are dark-brown and oblong in shape ; 2 by 1 mm., three-angled, tapering towards the umbilicus, where there is a white V-shaped mark ; they are feebly pungent, and become coated with transparent mucilage when soaked in water. The seeds are stimulating and aphrodisiac.

Capparis spinosa *Linn.* (Capparidaceae). The root and root-bark.

Risha Kavar (Teheran) ; Risha Kabar (Hamadan) ; Keber (Schl.) ; Capparis Cortex Radicis (Ph. Pers.).

Ph. Ind. i. 131 ; Boiss. i. 420.

The thorny Caper plant is found in Western Asia, Europe, North Africa, and Australia. According to Dr. Aitchison it is a common shrub from Quetta to Meshad, in the open country forming great bushes fully five feet high. In Persia, Dr. Cowan observed it as a low straggling bush often with stems trailing along the ground. *C. aphylla* Roth is very abundant in Baluchistan, where it is called by the same vernacular name (I.H.B.).

The flower-buds all through Persia are collected for household use to be made into pickles. The light-coloured root and the thick root-bark, in half quills, are used in medicine. These drugs have been introduced into India by Mohammedans, and are exported *via* the Persian Gulf. The root and root-bark are pungent and bitter, and are given for intermittent fever and rheumatism.

Carthamus tinctorius *Linn.* (Compositae). Achenes.

Kaufsha, Qushon (Hamadan) ; Tukhm-i-kaphah, Tukhm-i-kaphek (Pers.) ; Tokhme-kaficheh, idiom in Guilan (Schl.) ; Karophi (Bom.) ; Qurtum (Arab.) ; Kusum (Hind.) ; Atractus (Gr.), Safflower or Parrot seed.

Ait. ; Post ; Schl. ; Sino-Iranica, 324 ; Ph. Ind. ii. 308.

The Safflower is cultivated in Syria, Persia, and Afghanistan, as a field crop, for its red anthers, which are used as a dyestuff and cosmetic.

The fruits or achenes, of the size of barley grains, are kept in all druggists' shops. They yield an oil by expression which is good for rheumatism.

Carum copticum *Benth. & Hook.* (*Sison Ammi* Linn., *Trachyspermum Ammi* Sprague ex Turrill ; *Ptychotis Ajowan* DC. ; *Ammi copticum* Linn.). (Umbelliferae). The fruits.

Zinian (Teheran & Hamadan) ; Ajowan, Ajwain (Hind.) ; Omum (Tam.) ; Ammeos (Ph. Pers.) ; Komoune molouki (Schl.) ; Basilikon Kuminon (Gr.) ; Sium Ammi ; Bishop's weed.

Boiss. ii. 898 ; Fl. Br. Ind. ii. 682 ; Ph. Ind. ii. 116.

This is an African plant cultivated in Egypt, Persia, Afghanistan, and throughout India. The aromatic fruits were a well-known medicine among the ancient Greeks and Arabs, and still enjoy a great reputation in the East. The Persian drug is produced largely in the province of Shiraz. The fruits are brownish-grey and smaller and more curved than carraway seed. The fragrance and active principle of the drug reside in the 3 to 4 per cent. of essential oil which they contain. The oil holds a stearopten called thymol which crystallizes out at ordinary temperatures. Of the remaining portion half is thymene, a mixture of cumene and several terpenes. Thymol is known in India as Ajwain-ka-phul or Flowers of Ajwain. The distillate obtained when the fruits are boiled with water is called " Omum water," and is used as a carminative for children and as a cholera remedy.

Cassia Absus *Linn.* (Leguminosae). The seeds.

Cheshum (Hamadan) ; Chashum, cheshmak, chashmizak (Pers.) ; Hebbel soudane, Hab-us-sudan (Arab.) ; Chaksu seed of India ; Egyptian Cassia seed.

Ph. Ind. i. 524 ; Fl. Br. Ind. ii. 265.

This is a plant widely distributed in the tropics of the old world. The small, black, lens-shaped seeds have long been known in the East in the treatment of eye diseases. In some books a plaster made of the seeds is recommended as an application to wounds and sores. In Hamadan the seeds are classed among the poisons (C).

Centaurea Behen *Linn.* (Compositae). The root.

Rishe bahman (Hamadan) ; Bahman, behmen, barham (India) ; the name is supposed to be derived from Brahma as a drug given to convey superior intelligence.

Ait. ; Post ; Boiss. iii. 682 ; Ph. Ind. ii. 303.

The plant grows in Persia, Syria, and Armenia. Boissier speaks of Bahman coming from the hills of Khorasan. Aitchison says it is a medicine from Kabul exported into India.

There are two kinds of this drug, Sufed (white) and Surkh (red) Bahman. The root from Hamadan appears to be the latter. The root is in short pieces, cylindrical, about 2·5 cm. in diameter, with a scaly crown, reddish-brown, scabrous, marked by numerous circular wrinkles externally ; within, the wood is dull red and with yellowish, horny layers, and no starch. This drug does not appear to be the same as Red Rhapontic, which has been referred to the root of a paeony.

Chenopodium capitatum *Aschers.* (Chenopodiaceae). The seeds.

Tukhm-isfanj (Pers.).

The seeds of this species of goosefoot are sold as a food-grain and medicine, and the plant is used as a pot-herb. The seeds are black, rounded and disc-shaped, 1 mm. in diameter. In mountain areas in South America the seed of *C. Quinoa* Willd. has long been known as a cereal, and supplies food where other food crops cannot easily be grown.

Cichorium Intybus *Linn.* (Compositae). The root and achenes.

Risha-kashni (Hamadan); Tukhm-kashni (Ham. & Teheran); Kashi (Hind., Bom. & Beng.); Intubus (Rom.); Sem. Cichorii (Pharm. Pers.).

Ph. Ind. ii. 311; Boiss. ii. 716; I.H.B.

The Chicory plant is indigenous to Persia, and is cultivated in Europe and India. It is a common weed over all well-cultivated land in the vicinity of water-courses and wherever there is damp, clay soil. It goes under the same name as the Endive, and the natives of East Persia do not distinguish between them (Aitchison).

The root is fleshy and tapering, wrinkled longitudinally, light-brown externally, and whitish within. The dried and torrefied root is well known as an article for mixing with commercial brands of coffee. In Persia, Baluchistan, and India it is a resolvent and cooling medicine for bilious attacks. The achenes are angled, of a pale, mottled-grey colour, and with a bitter and mucilaginous taste. They also are considered a cooling medicine.

Cirsium lanceolatum *Linn.* (Compositae). Thistle-down.

Foveh (Hamadan).

Achundow; Boiss. ii. 538; Post.

This species of Thistle is frequent in Syria, Persia, Afghanistan, and Kurdistan.

The drug consists of the white feathery pappus, 3 cm. long, of the dense capitula of this plant. With it are mixed a few tubular florets and a few linear-oblong, compressed, smooth achenes. They are said to be used locally for gonorrhoea.

Schlimmer refers to a medicine called "Badawerde" (=carried by the wind), consisting of the pappus of the Holy Thistle (*Carduus benedictus*). In India the downy heads of *Volutarella divaricata* Benth. are used as a drug (Ph. Ind. ii. 306). Badaward has also been referred to *Echinops candidus* (now *E. Cephalotes* DC.), a true Persian plant. It is unusual for a drug consisting of cellulose to be used internally. Probably it is for external application. In India the soft, woolly inflorescence of the male spadix of a bullrush (*Typha angustifolia* Linn.) is applied, like cotton, to wounds and ulcers (Ph. Ind. iii. 538).

Citrus Aurantium *Linn.* (Rutaceae). The flowers.

Bahār-i-narendj, 'Spice of orange' (Teheran); Behare narundj, Naphae flores (Schl.); orange flowers.

Ph. Ind. i. 270.

The dried flowers of the cultivated orange growing in Persia are sold in the bazaars and are recommended as a stomachic. Neroli oil and orange-flower water, obtained by distillation, are used in perfume and for medicine. Schlimmer in his Terminologie refers to Aqua florum aurantii or Aqua naphae as a favourite flavouring agent. The oil contains a nitrogenous substance of exceeding fragrance called anthranilic acid methyl-ester.

Colchicum luteum *Baker*, and **C. speciosum** *Stev.* (Liliaceae). The corms.

Sulenjan (Teheran); Surinjan-i-talkh (Pers.); Schanbelid; Hermodactyl, the finger of Hermes (Gr.).

Achundow; Ph. Pers.; Boiss. v. 155; Schl.; Ait.; Ph. Ind. iii. 496.

The yellow-flowered *Colchicum* is found on grassy slopes in the temperate Himalaya and Kasknir, Afghanistan, and Turkestan.

C. speciosum is met with throughout the Badghis, Harirud, and Khorasan. The corms or bulbous roots are mixed with those of *Merendera persica* and constitute the Hermodactyls of the later Greeks (Aitchison). The roots of both plants are used in Persia. The Indian drug appears to be the corms of *C. luteum* imported from Kashmir. The corms are ovate, 3·5 to 5 cm. long, white, hard, and horny. The starch is muller-shaped with a hilum. Both species afford the alkaloid colchicine, and are used, as *C. autumnale* in Europe, for rheumatism.

Commiphora Molmol *Engl.* (Burseraceae). Oleo-gum-resin.

Murr-e-makki (Teheran); Mur, bol (Hind. & Bom.); Myrrha mechensis (Ph. Pers.).

Abu Mansur; Schl.; Pharmacog., 125; Ait.; Ph. Ind. i. 304.

This fragrant oleo-gum-resin, known as Myrrh, is one of the most ancient drugs in the orient. It is obtained from plants growing in North-east Africa and South Arabia and is brought to India, where Bombay is the centre of the trade. Aitchison says it is imported into Meshed through Persia for further transit to Afghanistan and Turkistan. Myrrh is an important drug among Mahommedans, who suppose that it originally came from Mecca. It is used as a stomachic.

Commiphora Mukul *Engl.* and other species. (Burseraceae). Gum-resin.

Mukul-agrak (Teheran); Moghl-ezregh (Schl.); Bdellium (Pers.); Indian Bdellium.

Ph. Pers.; Tschirch; Pharmacographia; Ph. Ind. i. 311.

The Mohammedans describe the different kinds of Bdellium under the name of Mukul, and say that it is the produce of a tree common in Arabia and also in India. Several kinds are distinguished, all of them bitter. That with a reddish tinge is termed Mukul-i-azrak; with a yellowish-tinge, Mukul-i-yahud; brown, Sakulali; and with a rich red-brown colour, Mukul-i-Arabi. Gum-resins from trees in the arid

zones of Sind, Kathiawar, and Rajputana are used as substitutes for the African and Arabian Bdelliums. Aitchison says the Bdellium in the bazaars of Afghanistan is imported, but adds that fragrant gum-resins obtained from spurious shrubs in dry desert regions are indistinguishable from the imported product. The Persian sample is sticky and bitter, and forms a milky emulsion with water. The medicinal properties of Bdellium are regarded as the same as those of myrrh, and the drug is given in muscular rheumatism and is applied to painful parts in the form of " lep."

Conium maculatum *Linn.* (Umbelliferae). The fruits.

Karedemonah (Hamadan) ; Kirdamana (Bom.) ; Choquerane, Bikhe sifti (Schl.) ; Hemlock fruits.

Boiss. ii. 922 ; Ph. Ind. ii. 110.

The Hemlock is a poisonous British plant distributed in Europe and Northern Asia, but not in India.

Aitchison met with the plant, fully seven feet in height, in Karobagh in North-eastern Persia.

Arabian and Persian physicians repeat in their writings the opinion of the Greeks in regard to Hemlock.

The fruits and leaves contain a poisonous alkaloid—conine—which paralyses the motor nerves. The fruits are one of the poisons of Persia and are used locally as a lotion to allay pain.

Cordia Myxa *Linn.* (Boraginaceae). The fruits.

Sepestan (Teheran) ; Sebestan or Sapistan, from Sagpistan, " Dog's dugs " (Pers.) ; Sebestan plums.

Achundow ; Ph. Pers. ; Schl. ; Post 532 ; Boiss. iv. 124 ; Ait. ; I.H.B. ; Ph. Ind. ii. 518 ; Cordia Myxa and allied species, J. Hutchinson, Kew Bull., 1918, 217.

Cordia Myxa, the Arbor glutinosa of Rumphius, is a common shrub or small tree frequently cultivated, and found in regions extending from Egypt to Cochin-China and Tropical Africa. The Sapistan is a well-known drug in the orient, introduced by the Arabians. It is a drupe of the size of a cherry with mucilaginous properties, and is sometimes used in making birdlime. Aitchison says the fruits are chiefly imported from Southern Persia to be employed in medicine, and are forwarded in quantity to Turkestan. On account of their demulcent properties they are useful for coughs and chest complaints.

Coriandrum sativum *Linn.* (Umbelliferae). The fruits.

Tukhm-i-kashniz (Teheran) ; Kuzbura, kozbara (Arab.) ; Kisniz, Kosniz (Pers.) ; Gashnish (Turki) ; Kostumbari (Sans.) ; Dhanya (Hind.) ; Koriyan (Gr.) ; Coriander seed.

Achundow ; Schl. ; Laufer ; Fl. Br. Ind. ii. 177 ; Ph. Ind. ii. 129.

The Coriander plant is cultivated as a pot-herb and for its fruits in gardens throughout Persia, Afghanistan, and India. The globular

fruits are a well-known spice and flavouring agent. The plant is used in salads.

The principal constituent of the essential oil of the fruit is coriandrol, the dextro-gyrate modification of linalol.

Crataegus orientalis *Bieb.* (Rosaceae). The fruits.

Gwich (Hamadan) ; Kewiche (Ispahan) ; Kocha, gohja, kohela, alaf-kharez (Afg.) ; Naguncha, ghunza (Bal.).

Schl. ; Boiss. ii. 660 ; Post ; Aitchison ; I.H.B.

The Oriental Hawthorn is a shrub or small tree of Asia Minor and the Caucasus. This and other species grow at an elevation of 3000 ft. and upwards, and are common at the heads of springs in the lower hills ; they provide an excellent fodder for goats, sheep, and camels. The wood is valuable for the manufacture of spinning wheels. The fruits of most species are used in medicine. The fruit of *C. Azarolus* Linn., a tree of Persia and Asia Minor, is the Lu'rur of Achundow : Schlimmer notices the fruits of *C. oxyacantha* Linn. and *C. melanocarpa* in his list of Persian drugs. The fruits from Hamadan are pome-like, rounded, 12 mm. across, with a reddish-brown, wrinkled pericarp, surmounted by an umbilicate disc, and minute lobes of the calyx ; within are three oval, light-brown, hard pyrenes. The fruits contain sugar, and are supposed to act as an opiate (C), whilst the seeds are given for spermatorrhoea.

Croton Tiglium *Linn.* (Euphorbiaceae). The seeds.

Habb-el-salatin, " Sultan's seeds " (Hamadan) ; Habb-el-khatai, " Cathay (China) seeds " ; Bidend jireh khatai, " Castor-oil seeds from China," Habb-dilmaluk (Ait.) ; Jamalgota (Punj.).

Ait. ; Schl. ; Ph. Ind. iii. 281.

This is a small tree indigenous to China and N.E. India, now under cultivation throughout the greater part of India and the East.

Croton seeds were known to the Persians at a very early date and were doubtless introduced from China by the caravan route through Central Asia. They were described by Acosta in 1578, and called Pinones de Malaca. They are now imported from India.

They are oblong, 12 mm. long by 9 mm. broad, with dorsal and ventral surface arched. The testa is black, covered with a brown membrane ; the oily albumen is enclosed in a delicate white membrane, and has two foliar cotyledons. The seeds contain a violently purgative oil, and are classified by the Persians among the poisons.

Cucurbita Pepo *DC.* (Cucurbitaceae). The flowers.

Gul-i-Kadu (Hamadan and Teheran) ; Kadu (Hind.).

Ait. ; Schl. ; Fl. Br. Ind. ii. 622.

The Pumpkin is largely cultivated as a vegetable in Persia and Afghanistan. The seeds provide the usual medicinal product of this plant, but the flowers, chiefly corollas, are sold in the bazaars of Teheran and Hamadan ; they are yellow in colour and about 3·5 cm. long. The flowers are made into a decoction and applied to

the face to improve the complexion. They are also administered for chest troubles (C).

Cuminum Cyminum *Linn.* (Umbelliferae). The fruits.

Goi-Zira, "Green-Weed" (Turki, in Tabriz); Zira (Hind.); Jira (Beng. & Bom.); Cammun (Syr.).

Post 373; Gilliat-Smith & Turrill, Kew Bull. 1930, 390; Ph. Ind. ii. 113.

The Cummin plant is grown in gardens as a pot-herb, and the seeds, or properly fruits, are sold in the Persian bazaars as a condiment and medicine (Gilliat-Smith). There are three kinds of cummin recorded by Persian and Arabian writers; Kamun Farsi or Persian, Kamun Nabli or Nabatean (N.W. Arabia), and Kamun Kirmani or Black Cummin. The latter is probably the product of *Carum nigrum* Royle.

Cummin is a favourite condiment in India and other Eastern countries. From the cradle of civilisation in Egypt its use has spread to Arabia, Persia, India and China.

Cuscuta hyalina *Roth.* (Convolvulaceae). The herb, flowers, and seeds.

Gul-i-geshush (Hamadan), Flowers; Geshush, Kasus (Hamadan), Herb; Aftimun (Teheran), Flowers and seeds; Kochouce (Pers. lit.); Kushooth is the Arabic name for dodder. Kassutha (Gr.), Cuscuta (Lat.), hence Keshus (Pers.); "Kill weed."

Boiss. iv. 117; Ph. Ind. i. 548; Sci. pa. 240.

Of the above three samples of Persian drugs those from Hamadan appear to belong to *C. hyalina*. Gul-i-kasus (the flowers) and Tukhm-i-kasus (the fruits) are exported from Persia to India mixed with the leaves and spines of the plants on which they grow. The seeds are light-brown and have a bitter taste. The flowers are given for asthma and the thin filamentous stems for obesity. The drug Aftimun (Epitymon, Gr.), growing on a malvaceous plant, has larger flowers, and is probably derived from *C. europaea*, a native of Europe and Western and Central Asia. It is given as a digestive and purifier of the blood, just as in Europe dodder is an ancient remedy for intestinal disorders as constipation and flatulence.

Cymbopogon Schoenanthus *Spreng.* (Gramineae). Stems and leaves.

Azkar (Teheran); Izkhir (Arab.); Khavi (Hind.); Juncus odoratus; Herba Schoenanthi; Camel grass.

Ph. Pers.; Schl.; Ph. Ind. iii. 557; Oil-grasses of India and Ceylon, by O. Stapf, Kew Bull., 1906, 297.

The drug sent under this name is intended to represent the Persian and Indian drug Ishkar or Izkhir-i-jami, the stem and root of a fragrant grass introduced originally from Arabia. But the drug, although fragrant, consisting of the lower part of a leafy stem with a few wiry rootlets, could not be botanically recognised as a

grass. Kaempfer in his Travels in Persia in 1683-1688 speaks of the distillation of the oil from the grass Izkhir (Amoen. Exot. 1712). Preparations of the fragrant oil-grasses are used locally for debility.

Cynara Scolymus *Linn.* (Compositae). The fruits.

Kangar (Teheran); Kinguere (Schl.); Ardi-shauki (Arab.); Enghinar (Turki); Artichoke seeds.

Achundow; Boiss. iii. 557.

The Artichoke is a cultivated plant in Persia. The hard, white, polished fruits or achenes are used in medicine. They are called in some books kunghir, but according to Gilliat-Smith kangar is a name in Persia applied to almost any thistle. Aitchison believes that this name must have originated from the Persian name of the allied plant, the Prickly Artichoke (*Gundulea Tournefortii* Linn.). This plant, according to Schlimmer, exudes an emetic resin (Kangar-zad), which is used medicinally. Another plant, *Cirsium yamense* Turrill, is called Kangar in Tabriz, where the underground shoots are eaten in the spring and called "artichoke" by the European Colony (Gilliat-Smith). The fruits in this collection, however, are those of the ordinary artichoke.

Cyperus rotundus *Linn.* (Cyperaceae). The tubers.

So-ad (Hamadan); Suad, Su'd (Pers.); Seid (Sudan); Motha (Hind.); Mustaka (Sans.); Muschk-i-zemin, earth musk; Rad. junci odorati (Ph. Pers.); Hsiang fu (Chin.).

Achundow; Ph. Pers.; Ph. Ind. iii. 552.

This sedge grows plentifully in moist or boggy ground. The small, dark, hairy tubercles are ovate-oblong, pointed at both ends, about 2·5 cm. or less in length, brown, hard, and horny. They have a somewhat lemon-like fragrance.

These tubers, known throughout Asia for their perfume and medicinal properties, are used for cleaning the teeth, and are placed among clothes to keep away insects. Their general action is tonic, stimulating, and stomachic.

Datura Stramonium *Linn.* (Solanaceae). Seeds and leaves.

Tukhm-tatulah (Pers.); Dhatura (Hind.); Jouj macel (Arab.); Shinah azghi (Bal.); Stramonium.

Ait.; Ph. Ind. ii. 586; Y.B. Pharm. 1927, 49; Synopsis of Genus Datura, W. E. Safford, Journ. Wash. Acad. Sci., 19 Apr. 1921.

The Thorn-Apple inhabits North, Central, and South America, and was introduced at a very early date into the warm regions of Europe, Asia and Africa. This species is a weed in Persia, and the name has been borrowed from other countries. Specimens of the seeds came from the bazaars of Teheran and Hamadan, and leaves from Hamadan, where they are sold among other drugs. Both seeds and leaves are used as poultices to allay pain. The natives recognise the poisonous properties of the seeds, and sometimes called them Kachola, the name for the seeds of Nux vomica, as both are used for

killing dogs. They contain the alkaloid hyoscyamine with small quantities of atropine.

Doronicum Pardalianches *Linn.* (Compositae). The root.

Darunech (Hamadan); Darunej-i-akrabi (Pers.); Darounedge eghrebi (Schl.); Doronic (Gr.); Doronicum Graeci (Ph. Pers.); Doronicum root.

Achundow; Boiss. iii. 379; Makhjan-el-Adwiya; Ph. Ind. ii. 292; Kew Museum.

This ancient drug is said to have come originally from Greece and Syria. *D. scorpioides* Lam. affords some supplies of the drug, while *D. Falconeri* C. B. Cl., of the Himalayan region, has been identified as the origin of samples of the drug in India. It is a peculiar knotted root, like the tail of a scorpion, and white, like alabaster. It contains inulin instead of starch, and is acrid and bitter. In Persia it is regarded as poisonous. It is useful in nervous depression, and is prescribed, according to the law of signatures, for persons bitten by scorpions and insects.

Dracocephalum Moldavica *Linn.* (Labiatae). Herb and seeds.

Badranj-buya (Teheran); Badirash-bu (Tabriz); Badrendj-bouyih (Schl.); Baklat-el-utrujuya (Arab.). The Persian name means "the scented remedy for flatulent colic."

Achundow: Boiss. iv. 672; Ait.; Schl.; Ph. Ind. iii. 117.

Badrandj-buya is an important drug in Persia, and has been variously referred to species of *Nepeta*, *Calamintha* and *Melissa*, plants having the odour of balm. Achundow determined the source as *Melissa officinalis*. Aitchinson says the drug consists of the seeds of a labiate, while Dymock describes it as the flowers and seeds of a hyssop. The drug from Teheran is a mixture of broken stalks and seeds with some gland-dotted leaves. From Tabriz Mr. Gilliat-Smith sent seeds of the above-mentioned species of *Dracocephalum* under the same vernacular name, thus confirming the identification of Schlimmer in 1874. The seeds are black, somewhat torpedo-shaped, 2 mm. long, with a white V-shaped mark at the pointed end. They afford an opaque mucilage when soaked in water. The drug is esteemed locally, and is exported to India and elsewhere as a carminative and tonic. For another source of this drug see *Asperugo procumbens*.

Echinops persicus *Stev.*, and other spp. (Compositae). Cocoon cases of a beetle.

Schakar tigal, "Sugar of nests" (Pers.); Chek kere tighal (Schl.); Gol tighol of Royle; Tréhala manna.

Ph. Pers. 1681, p. 361; D. Hanbury, Journ. Linn. Soc. 16 Dec. 1858; Science Papers, 158-164; Schl.; Apping, 1885; Ebert, 1909; Tschirch, 1912.

Tréhala is a sweet substance found in cocoons of a beetle occurring on the leaves and stalks of *Echinops persicus* and other species of *Echinops* found in Persia, Turkey, and Caucasus. The beetle is

Larinus maculatus Fald (Guldigul, Pers.), one of the Curculionideae. This insect forms a rough, chalky-looking nidus or cocoon, rounded-oval, 18–20 mm. long, yellowish-white, rough on the outside and smooth within. The cocoon contains from 15 to 23 per cent. of a special sugar, called by Berthelot trehalose, identical with mycose, the sugar of certain Fungi. Besides sugar there is present mucilage, amylodextrin and cellulose. This peculiar secretion, known since the time of Avicenna, is given in Hamadan for coughs and to relieve the respiratory organs.

Echium plantagineum *Linn.* (Boraginaceae). The corollas.

Gul-i-gao-zaban (Teheran); the Persian name means "Flowers of cow's tongue"; Flowers of Bugloss.

Boiss. iv. 208.

According to Dr. Aitchison the drug, under this Persian name, has been supplied by *Caccinia glauca* Savi and *Onosma macrocephala* DC. Schlimmer refers the origin of the drug to *Anchusa italica*, but remarks that druggists mix it with the flowers of *A. hybrida*. Dymock says the leaves and flowers of *Trichodesma molle* DC. come to Bombay under this name (Ph. Ind. ii. 521 and Appendix). In Baluchistan the drug is referred to *T. indicum* R. Br. (I.H.B.). In Sind it has been obtained from *T. zeylanicum* Br. It thus seems that Gul-i-gao-zaban is a generic name for the blue flowers of the Borage family. The above species of *Echium* occurs in Asia Minor, Transcaucasia, and North Africa. The blue corollas from Teheran belong to this species; they are 3 cm. long, 12 mm. wide at the throat, funnel-shaped, almost bilabiate, and slightly hairy. The flowers are considered a very good cardiac, tonic, demulcent, and laxative (C).

Embelia Ribes *Burm.* f. (Myrsinaceae). The berries.

Biranj-i-Kabuli (Teheran); Barhang-i-Kabuli (Pers.); Berengue Kaboli (Schl.); Baberang (Hind.); Embely currants.

Fl. Br. Ind. iii. 513; Schl.; Ph. Ind. ii. 349.

This shrub grows throughout India. The fruits are an ancient medicine in the East. Susruta described the anthelmintic properties of the fruits, which were given the Sanskrit name Vrisha-nasana, "destroyer of enemy" (worm). The drug is referred to in all Mohammedan works of medicine, and Rheede, Ainslie, Roxburgh, and Royle have added confirmatory evidence of the value of the berries for removing tape-worm (taenia) in children and adults. The fruits were given a place in the Indian and Colonial Addendum of the British Pharmacopoeia. The fruits are globular, dull-red, smaller than pepper corns, with a 5-partite calyx, and stalked. The outer shell is striated from base to apex, with a small beak. Inside it is reddish-brown marked by dark spots; the seed is horny with a reddish-brown crystalline efflorescence.

Dr. Warden in 1888 separated from the drug a crystalline active principle in golden spangles which he named embelic acid. Brissemoret in 1907 showed this substance to be an oxyquinone.

Erysimum repandum *Linn.* (Cruciferae). The seeds.

Tukhm-i-Khākshīr (Hamadan); Khakechi (Schl.); Khubah (Arab.); Kashir (Bal.).

Achundow; Ait.; Schl.; Boiss. i. 189; Fl. Br. Ind. i. 153; I.H.B.

This is a small annual herb, hoary with close appressed hairs. It is frequent in Kashmir, Persia and westwards to Europe and West Africa. The seeds, with those of *Sisymbrium Sophia*, *S. Irio*, and other cruciferous plants, are exported into India from Persia under the name of Khakshir. The seeds from Hamadan are small, oblong, 1 mm. long, reddish or yellowish-brown, smooth, shining (not dull like those of *S. Sophia*), one surface convex and the other grooved, ending in a depression. When placed in water they become coated with transparent mucilage. The kernel is yellowish and oily, and has the flavour of mustard. The seeds are given in fever, and externally, in the form of a poultice, they relieve pain in the stomach (C).

Ferula galbaniflua *Boiss.* (Umbelliferae). The oleo-gum-resin.

Biriz (Teheran); Barije, barzad (Pers.); Jao-shir (Arab.); Gum Galbanum.

Boiss. ii. 988; Schl. 295; Sino-Iranica, 363; Ait.; Ph. Ind. ii. 152.

Dr. Aitchison describes the Galbanum plant as being found in moist localities, as in the Badghis near Gulvan, where it grows in sandy soil. When in full blossom the flower is of a brilliant orange-yellow; as the fruit forms and ripens the colour changes, showing various autumnal tints. The stem is thick at the base, tapering suddenly and reaching a height of about four feet. The stem, on injury, yields an orange-yellow juice which slowly consolidates and has a strong odour resembling celery. This gum-resin is an article of export through Persia *via* the Gulf to Arabia and India. The sample from Teheran is said to have come from Kurdistan and Mazanderan. Galbanum is used internally for colic and is a useful stomachic. Externally it is applied as a plaster to sores and wounds. The drug contains resin 65, gum 20, essential oil 10–22 per cent., chiefly a terpene, d-pinene.

Ferula sp. (Umbelliferae). Oleo-gum-resin.

Sek-benedge (Teheran); Sagbinaj (Arab.); Iskabinah (Pers.); Sek biniedge (Schl.); Sagapenum.

Achundow; Ait.; Schl.; Sino-Iranica, 366; Ph. Ind. ii. 161.

Sagapenum is a fragrant gum-resin obtained from an undetermined plant in Laristan. Previous writers have suggested *Ferula persica* Schl. and *F. Szovitsiana* DC. as its botanical sources, but these have not been confirmed. The Makhzan-el-Adwiya states that the drug is brought from Shiraz and Kerman. As found in the market, the tears adhere into brownish-yellow cakes, translucent, with a persistent alliaceous odour and acrid taste. It yields by distillation a volatile oil containing sulphur. In the form of a plaster the drug has a local reputation for rheumatism.

Foeniculum vulgare *Mill.* (Umbelliferae). The fruits.

Razione (Teheran and Hamadan); Razianah (Pers.); Dadli boyana (Tabriz); Razianaj (Arab.); Shum razionj (Syr.); Fennel.

Post, 356; Schl.; Ph. Ind. ii. 124; On the commercial varieties of Fennel, J. C. Umney, Pharm. Journ. 58 (1897) 225; I.H.B.

Fennel is a stately umbelliferous plant cultivated for its fruits in several parts of Europe and Asia. The fruits are frequently in the bazaars confounded with aniseed (*Pimpinella Anisum* Linn.) the Persian name for which is Badian. A sample of fruit from Teheran labelled Badian, for instance, was that of Fennel. The fruits, commonly called seeds, are greyish-brown, slightly curved, beaked, with 5 prominent ridges on each mericarp, about 6–7 mm. long. The taste is sweet and aromatic. They yield from 3 to 5 per cent. of essential oil containing, as the principal ingredient, anethol, which constitutes 50 to 60 per cent., with a small amount of a compound with a bitter taste called fenchone. J. C. Umney found the odour of Persian fennel nearer to anise than any other variety of fruit examined, the percentage of anethol being higher and fenchone comparatively low. Fennel is a valuable condiment, and enters into mixtures given for dysentery and colds.

Fritillaria imperialis *Linn.* (Liliaceae). The corms.

Gul-i-samigun (Teheran); Gole-samagune, "The bulbs of the topsy-turvy"; "The tubers of a plant, the flowers of which, according to the natives, hang upside down, considered rare in Afghanistan and highly valued as a medicine" (Aitchison). Schlimmer refers the drug to *F. acmopetala*. Another Persian name for this plant is Gul-i-shirper, "flowers of six feathers" (L. J. Jefferies, mountains of Dasht Arjin, Farsistan. 1888).

Boiss. v. 189; Ph. Ind. iii. 498.

The Crown Imperial. The drug consists of broken pieces of thick corms. They are of a whitish colour, without odour or taste. The starch is oval and regular. An alkaloid has been separated from them by Fragner. The corms of species of *Fritillaria* are a valuable medicine in the Far East, chiefly for chest complaints. Regarding the Persian drug it is said, "When a woman has a child, a paste is made from it and is put on her stomach to reduce pain." (C).

Fumaria parviflora *Lam.* (Fumariaceae). The herb and fruits.

Shah tara (Teheran); Tukhm-i-Shahtara (Hamadan); Shahtarra, "royal herb;" Tarra, "pot herb" (Pers.).

Achundow; Schl.; Boiss. i. 135; Fl. Br. Ind. i. 128; I.H.B.; Ph. Ind. i. 114.

The Fumitories are medicinal herbs employed throughout India, Afghanistan, and Baluchistan. The above species is found as a weed of cultivation, and the fruits are collected and exported.

The herb and fruits are both used in medicine. The herb occurs as broken fragments of stem and leaves with a slightly acid and

astringent taste. The fruits are green, globular, the size of a pin's head, apiculate, rugulose on the surface, and one-seeded. They have hardly any odour, and the taste is slightly acrid and astringent. The plant contains fumaric acid and the alkaloid fumarine. Shahtara is highly esteemed by Mohammedans in India; it is said to purify the blood and act as a laxative and diuretic. In Persia it is often mixed with chicory for medicinal purposes.

Gaillardia aristata *Pursh.* (Compositae). The fruits.

Ra'ana ziba (Teheran); Ra'ana (Arab.), Ziba (Pers.), both words meaning "beautiful."

This drug consists of the achenes of a North American plant grown in Persia for its handsome yellow and red flowers. The small villous achenes are surmounted by a ring of 6 to 10 hyaline pales, each 1-nerved, ending in a bristle. The plant is noticed by Mr. Gilliat-Smith as being cultivated in gardens near Tabriz, where the local name is Zilf-afshan.

Gul angrezi ("English-flowers") and Gul ashrafi are the names of the dried flowers of *G. pulchella* Fouger, a plant introduced into Baluchistan (I.H.B.). The medicinal properties of these drugs are not stated.

Glycyrrhiza glabra *Linn.* (Leguminosae). The root.

Risha asra sus (Teheran); Sus, asus (Pers.), the plant; Bekh-sus, the root-stock; Rob-asus, asal alsus, the extract.

Achundow; Ait.; Boiss. ii. 202; Post, 277; Schl.; Ph. Ind. i. 491.

Aitchison says the liquorice plant is a characteristic and extremely common shrub in the Badghis and Khorasan, at an altitude of above 2000 ft., and most luxuriant in loamy soil where there is moisture. In the latter localities the annual shoots grow to four feet with enormous underground rootstocks, which are sometimes used as fuel. The nomads collect these rootstocks from which they prepare the extract of liquorice. Post remarked that in Syria liquorice is a variable species in waste fields and on dry hillsides, crowding out other vegetation. Schlimmer refers to three species, *G. glabra*, *G. echinata*, and *G. violacea*, while Boissier makes several varieties of the plant. It occurs also in Baluchistan. India obtains market supplies from Persia and Sind, and Aitchison suggested its cultivation in Quetta, Kohat, Peshawar, and other localities on the North-western Frontier. Throughout Asia liquorice root and its extract from time immemorial has been used for cough and chest complaints. In northern Persia the fibre of the root left after the preparation of the extract has been known to be made into paper.

Gypsophila paniculata *Linn.* (Caryophyllaceae). The root.

Zuleh (Hamadan); El-sabuniyeh, of the Arabs; Saosafed, Bekh (Ait.); Kundur, Kundusch (Achundow); Soap root.

Aitchison; Post; Boiss. i. 542; Ph. Ind. i. 155.

A shrubby plant of North Persia, Afghanistan, the Caucasus and Turkestan, 3 to 4 feet high with numerous stems springing from a perennial root-stock. The plants are characteristic of sandy soil; in Khorasan they are wild in cultivated ground. The underground root-stocks are collected and used as soap for washing the hair and clothes. In Persia the roots are regarded as poisonous. They contain the glucoside saponin; Kobert in 1904 separated from 6 to 16 per cent. of this principle from various samples of soap root. The Persian drug is no doubt a substitute for the older Roman and Egyptian Struthium, the root of *G. Struthium* Linn. of S. Europe. According to Achundow some of the vernacular names may refer to other saponin-yielding plants. *G. Arrostii* Guss. is the origin of the Levantic soap root.

Helicteres Isora *Linn.* (Sterculiaceae). The fruits.

Pachman-i-puh (Teheran); Kisht bar Kisht (Pers.); Pechak (Hind.); Avartin (Sans.); the Persian and Sanskrit names signify the furrows on a ploughed field.

Ibn Baitar; Achundow; Fl. Br. Ind. i. 365; Ph. Ind. i. 231.

The East-Indian Screw tree occurs in the dry forests throughout Central and Western India, and in Ceylon, and is found also in Java and northern Australia.

The spirally curved fruits are sold in all Indian bazaars, and their medicinal reputation is evidently known in more northern countries. The fruit is composed of fine slender, angular carpels twisted like corkscrews, and together forming a cone 3·5 to 5 cm. long. The carpels are pubescent and greenish-brown, and each one contains a single row of dark-brown, angular seeds. The drug has demulcent and slightly astringent properties, and is employed as a medicine for dysentery, for griping of the bowels, for flatulence in children, and for improving the appetite.

Heracleum persicum *Desf.* (Umbelliferae). The fruits.

Goleper (Kermandshah); Giafari (Schl.).

Schl.; Post; Boiss. ii. 1044.

This species of cow parsnip is indigenous in the moist valleys of the Elburz mountains, and is related to *H. pubescens* M.B., of a wider range. Boissier refers the plant Goulpere to *H. lasiopetalum*. The fruits, which are sold as a spice, are ovate-oblong, villous on the back, margin aculeate, the dorsal vittae thick and clavate, extending to two-thirds the length of the mericarp. While some of these plants are used medicinally and for food, other species in America and Europe are poisonous and produce erysipelatous inflammation (Cormerin, Des Plantes Vénéneuses, 1887).

Holarrhena antidysenterica *Wall.* (*Wrightia antidysenterica* Grah.). (Apocynaceae). The seeds.

Tukhm-zaban-i-gungishk-i-talk, "seeds of the bitter sparrow's tongue" (Pers.); Lizan ul asafir (Achundow); Indrajaou (Hind.); Estrefanthus.

Ph. Ind. ii. 392 ; Pyman, Journ. Chem. Soc. 1919; Fl. Br. Ind. iii. 645.

A small deciduous tree in the tropical Himalaya, ascending to 3500 ft., from the Chenab westwards ; throughout the drier forests of India, to Travancore and Malacca.

Samples of the seeds came from the bazaars of Hamadan and Teheran, showing that this Indian drug is well established in Persia. The seeds are narrowly linear-oblong, glabrous and brown, about 1·2 cm. long. They have a bitter taste due to the presence of an alkaloid, wrightine (conessine), which resides also in the bark of the tree, and may be separated in white crystals. Conessine acts like emetine. The seeds are reputed to have tonic and aphrodisiac properties.

Hyoscyamus reticulatus *Linn.* (Solanaceae). The seeds.

Bazr-el-banj (Hamadan) ; Bezor ol bendge (Schl.) ; Kohi bang (Bal.) ; Benj (Arab.) ; Bango (Port.) ; Henbane seeds.

Ait. ; Boiss. iv. 295 ; Schl. ; Post ; Ph. Ind. ii. 626.

This species of *Hyoscyamus*, as well as *H. muticus* Linn. and *H. pusillus* Linn., is found wild in Persia and Syria. Aitchison observed that goats and sheep grazed on Henbane plants without apparent bad effects, and the shepherds did not look upon these herbs as poisonous. The seeds of these plants are, however, regarded by native physicians as being as poisonous as opium ; they are exported from Persia to India. Henbane seeds are reniform, laterally compressed, greyish-brown in colour, with the testa finely reticulated. The taste is oily, bitter, and acrid.

The seeds and leaves contain the poisonous alkaloid hyoscyamine, the effect of which is to produce vertigo and insanity. The smoke of the seeds is inhaled for toothache.

Illicium verum *Hook. f.* (Magnoliaceae). Fruits.

Bādiān-i-khatai, " Anise of China " (Pers.) ; from Teheran.

Schl. ; Ph. Ind. i. 41.

The Star Anise of commerce is obtained from trees growing in South China and Cochin-China. South-east Kwangsi and Tonkin possess the world's monopoly of this product, and Hong Kong is the chief distributing medium for foreign countries. Star Anise was a new medicine in Persia a hundred years ago, but the fruits and oils are now shipped regularly to India from China, and reach Persia via Bombay. The star-shaped fruits, composed of eight brown, radiating, boat-shaped carpels, vary from 3 to 3·5 cm. in diameter. They contain about 5 per cent. of essential oil, consisting of solid and liquid anethol ; from 85 to 90 per cent. of anethol can be obtained from good oils by the freezing method. The fruits and oil are stomachic and are given to relieve cough and lung affections, and are used in confectionery and for seasoning food.

Inula Helenium *Linn.* (Compositae). The root.

Ghaza gouzanah (Teheran); Anduz (Hamadan); Gharsa; Pil gush, "Elephant's ear"; Rasan; Rasna of the Hindus; Andiz otu (Turki, *vide* Boissier ii. 186); Zendjebile chami, "ginger of Damos"; Zanjabil-i-shami, "Syrian Costus"; Aunée (Fr.); Helenion (Gr.); Enula campana (Med. Lat.); Elecampane.

Ph. Pers.; Schl.; Boiss.; Pharmacographia 340; Ph. Ind. ii. 259.

This plant is distributed in Central Asia and Central and Southern Europe. Schlimmer says the root sold in Persia comes from Baghdad and Damascus.

Elecampane root was an ancient medicine among the Greeks and its use spread to other parts of Europe and to Asia. It is not only an Asiatic drug but it is also recognised in the Pharmacopoeias of Germany, France, and the United States.

The root is hard and horny, brownish-grey in colour, paler within. The bark and wood are separated by a dark cambium layer; shining brown oil glands appear scattered over the surface of a transverse section, or are arranged in radiating groups. Crystals are seen in the interstices of old commercial samples. The root has an agreeable aromatic odour and a warm bitterish taste. In addition to inulin, which so frequently displaces starch in the Compositae, elecampane root contains from 1 to 3 per cent. of a solid crystalline mass permeated with a liquid oil containing alantic acid and alantolactone.

The root is given for bronchitis and tuberculosis and is a general aromatic tonic. It is used locally to reduce eruptions. From early times elecampane has been used as a substitute for or adulterant of the *Costus* of the East. Dymock mentions *I. Royleana* DC. and *I. racemosa* Hook. f. as plants affording roots for mixing with *Costus* in more recent times.

Ipomoea hederacea *Jacq.* (Convolvulaceae). The seeds.

Habb-el-nīl (Hamadan); Hab-un-nil (Arab.); Hebbonile (Schl.); Tukhm-i-nil (Pers.); Tukhm-i-nilafar (Afgh.); Kaladanah (Hind.); Ipomoeae cyanosae semina (old Herbals); Pharbitis seeds.

Ait.; Schl.; Fl. Br. Ind. iv. 197; Ph. Ind. ii. 532; B. P. 1914.

The above plant grows all over India. The flowers are blue, hence the name nilafar.

The seeds are blackish, forming the quadrant of a sphere, about 5 mm. long, with a minute protuberance at the upper end; they have a longitudinal dorsal groove, and dark-brown hairs on the hilar depression. These characters distinguish the seeds of this species from those of *I. muricata* Jacq. which are also used as a source of this drug. (Kassner, Pharm. Journ. 1924, [4] 58. 155, 203).

The action of these seeds is cathartic, due to the presence of an acrid resin. They are locally considered very poisonous.

Iris spuria var. **halophila** *Pall.*, and other species. (Iridaceae). The rhizome.

Risha-i-irisa (Teheran); Bikh-i-banafshah, "Violet root" (Pers.); Susan mund (Kash.); Irisa (Ind. bazaars); the name is a corruption of the Greek; Orris root.

Schl.; Boiss. v. 126; Ph. Ind. iii. 451; I.H.B.

The violet odour of Orris root has long been recognised in the East, and the root is accordingly used for its perfume and as a medicine. The rhizomes of different species vary in their activity and aroma. Aitchison says the rhizome of an *Iris* is called Orisa or Orisia in Afghanistan and is brought from Bijnort to the Meshed market. Bombay is supplied with Orris root from Persia and Kashmir. Dymock identified one source as *I. germanica* Linn. Three samples are in the collection from Persia, and the one from Hamadan agrees with the root of botanical specimens of *I. spuria* found in Kurdistan. In Baluchistan the rhizomes of *I. songarica* Schrenk, called Gharwasha, powdered with curds, are used to stop diarrhoea. *I. Stocksii* Hemsl. & Lace is eaten in the Quetta Valley. The roots sold in the Persian bazaar retain their outer peel and differ from the trimmed root sold in Europe. Irises are plentiful in Persia, and their roots might be profitably exploited for the home markets. The roots yield a glucoside, iridin, and an ethereal oil containing irisol.

Juniperus communis *Linn.* (Taxaceae). The fruits.

Habb-el-harār (Teheran); Hab-el-a'ra'r (Ind. bazaars); Er'er, djerdjere (Schl.); Juniper berries.

Ph. Pers.; Abu Mansur; Ph. Ind. iii. 371; B.P. 1914.

The Juniper fruits sold in Teheran are said to be collected in the Elburz mountains. The fruit is a galbulus, grey-brown, 8 mm. in diameter, apex with a triradiate scar; it contains three hard, triangular seeds with large oil-glands and yellowish resin. The odour is like turpentine and the taste sweetish.

The fruits are a well-known drug in India, where they are imported from the west. The essential oil is official in the British Pharmacopoeia. The fruits and oil have a diuretic action and are administered for dysmenorrhoea.

Lallemantia Royleana *Benth.* (Labiatae). The seeds.

Balingan (Hamadan); Tukhm-i-balung (Ind.); Tukhme balengon; Dracocephali Royleani semina (Schl.).

Boiss. iv. 674; Ph. Ind. iii. 90.

This plant is found throughout Persia, Baluchistan, Afghanistan, Turkestan, and Northern India.

The seeds are black, narrowly oblong, 3 by 1 mm., smooth, angled on the inner side, arched on the other, a white spot at the narrow end or umbilicus. When soaked in water they become coated with an opaque, grey, tasteless mucilage.

The seeds are used for cough, and as a cordial stimulant and aphrodisiac.

A similar drug, the seeds of *L. iberica* F. & M., is sold in the bazaars at Tabriz, where the seeds are called Gara za'rak, meaning " little black seed." The plant is a pot herb (Gilliat-Smith).

Languas officinarum *Burkill* (*Alpinia officinarum* Hance). (Zingiberaceae). The rhizome.

Kulenjan (Teheran) ; Gūlīndjān, Khulanjan (Pers.) ; Lesser Galangal.

Schl. ; Ph. Ind. iii. 437 ; Hanb. Sci. Papers, 370.

This plant is indigenous to the Chinese island of Hainan, and is cultivated on the neighbouring coast of Kwangtung and in Siam. The rhizome is an ancient spice and medicine of the East and is occasionally brought to European countries. The drug is exported from Hong Kong and the Straits Settlements to Calcutta and Bombay, and re-exported to Arabia, Persia and Egypt.

The root is about 5 cm. long and less than 1·3 cm. in diameter, often branching, externally of a rusty-brown colour, longitudinally striated, and transversely marked with remains of leaf sheaths. Internally it is greyish-brown and breaks with a fibrous fracture ; the odour is aromatic and the taste hot and spicy.

It yields from 0·5 to 1 per cent. of essential oil, containing cineol, to which the oil owes its camphor-like odour, eugenol, d-a-pinene, and probably cadinene (Gildmeister & Hoffmann ii. 278). Galangal root is used as a condiment, and in medicine it is given as a stomachic and for rheumatism.

Lavandula dentata *Linn.* (Labiatae). Flower-heads.

Astukudos (Teheran) ; Ustukhudos (Pers.) ; Osthoukhodouce (Schl.) ; The Persian name is derived from the Greek.

See paper on this drug by Mr. I. H. Burkill in the Journ. As. Soc. Bengal, N.S., Vol. v. No. 3, March, 1909, 67-71 ; Ph. Ind. iii. 93 ; Boiss. iv. 540.

These are the flower-heads of a species of Lavender sold in Teheran and brought from Shiraz. They constitute an ancient drug used by the Greeks and referred to by Arabian and Persian physicians. The name ustukhudos has been applied to *L. Stoechas* L., the Staechus of old works on Materia Medica, the Lavender of the Isle of Hyères. *L. Stoechas* of the Mediterranean region has purple flowers on short, stalked spikes, with downy heart-shaped bracts. Upper bracts form an abortive purple tuft at the top, and the herb has a camphoraceous odour and hot bitter taste. *L. dentata* has the odour of rosemary and camphor. The essential oil contains dextro-camphor and dextro-fenchone, and probably fenchyl alcohol. (Giessler, 1915). Oil of *L. dentata* is similar to that of *L. Stoechas* (Gildmeister & Hoffmann iii. 450).

An infusion is given for catarrh. Locally the drug is outwardly applied in cases of neuralgia, to check bleeding, for the washing of wounds, and as a remedy against eruptions.

Lecanora esculenta *Eversm.* (Parmeliaceae). The lichen.

Shir zad (Teheran) ; Chir zadi, Agalactie (Schl.).

Holmes, Manna, Chem. & Drugg. xcii. 25 (1920).

The manna lichen is abundant in North Africa and Western Asia, on rocks or on soil, and locally in the desert of Seistan. It varies from the size of a pea to a small nut, clear brown or whitish, the interior is soft, white with interlacing hyphae and crystals of calcium oxalate. There is a tendency for the thallus to develop excrescences of a nodular form which easily become free and drift about by the wind in the desert. Under the article "Agalactie" Schlimmer records historic references to this lichen being used as food from the time of Alexander the Great. According to La Cour (1880) and Elekin (1901), the lichen contains lichenin, but its nutritive value is very low. The name of the drug means "milk begetting," and it is used in Teheran to increase the flow of human milk after childbirth.

Lepidium sativum *Linn.* (Cruciferae). The seeds.

Tukhm-shahi (Teheran) ; Tereh tizec (Schl.) ; Assalia (Bomb.); Tara tezak (Afg.) ; Cress seed.

Ait. ; Schl. ; Ph. Ind. i. 120 ; Boiss. i. 354.

The cress or garden cress is a native of Persia and is widely distributed as a cultivated plant eastwards to Tibet. The seeds are exported as a drug from Persia to India and westwards to Europe. The seeds are light brown or reddish-brown, oblong, 3 by 1·2 mm., with a depression on the inner margin and a white spot at one end, cotyledons incumbent. They have a pungent cress-like taste and become coated with transparent mucilage when soaked in water. The seeds contain 50 to 60 per cent. of fatty oil. Myrosin, an enzyme, with water, yields a volatile oil. Phenyl acetic acid, nitrile or benzyl cyanide is the principal constituent of the essential oil (A. W. Hoffmann). The seeds are tonic, aphrodisiac and diuretic.

Lepidium Draba *Linn.* (Cruciferae). The seeds.

The Hoary Cress, a weed of cultivation, distributed westwards to Europe, is the Montchih of Ispahan ; Bajindak (Hind.) ; Buski seed of Baluchistan (I.H.B.). In Tabriz the young shoots are used as a salad under the name of "Khili-wili."

The seeds are smaller than those of the previous species, oval and dark brown. Seven or eight seeds are given as a dose for flatulence.

Linum album *Kotschy.* (Linaceae). Stems and flowers.

Sodabe (Hamadan) ; White Linseed.

Boiss. i. 858.

This is a glaucous shrub in Persia growing among crops. The lower parts of the stems are white and leafless. These stems and a few flowers form a drug which is used for syphilis, but the remedy is not recorded in other medicinal works of the East.

Linum usitatissimum *Linn.* (Linaceae). The seeds.

Basarak (Hamadan); Basarak katun, "Little seed of flax" (Pers.); Tukhm-i-katan (Ait.); Bazr ul kattan (Ach.); Bizre kattane (Schl.); the names for linseed in India are Alsi, Atasi and Alashi.

Ph. Ind. i. 239.

Aitchison informs us that in Afghanistan the Flax plant and seed are known as zagher; the oil of the seed as roghan-i-zagher; the fibre and linen cloth as katan or katun. The plant is cultivated in Turkestan for its seed for oil, but here, as in India, the fibre is not collected.

The seeds are largely eaten in sweetmeats, and the oil is employed both as a burning oil and in diet. In India the seeds are crushed and used as in Europe for poultices, and the oil is exported in large quantities from Calcutta.

Malva sylvestris *Linn.*, var. **mauritiana** *Boiss.* (Malvaceae). Flowers.

Panirak (Teheran); the name in Persian means "little cheese," from the shape of the fruit; Penirek, Khib-bazi (Schl.); Nan-i-kulagh, "Crow's beard"; Khitmi-i-kuchak, "Small khitmi" (Pers.); Hamam komandji (Turki).

Boiss. i. 819; Ph. Ind. i. 204.

Aitchison says the flowers of the Mallow (*M. sylvestris*), called Gul-i-khatmi, are collected and exported and employed in medicine in North-eastern Persia. Dymock remarks that three varieties of the plant are grown in India: (1) cultivated, molochia; (2) large wild, khitmi; (3) small wild, khubazi. Khubazi is the Arabic and Bombay name of the drug imported into India from Persia. The drug from Teheran consists of the flowers with the small rotate carpels of the fruit ("little cheeses") in an immature state. Khatmi or khitmi is usually applied to the larger-flowered plants of species of *Althaea*. The Teheran drug is used locally for whooping cough (C).

Merendera persica *Boiss. & Kotschy*. (Liliaceae). The corms.

Surinja (Hamadan); Surinjan, shambalit (Pers.); Colchicum Persicum (Ph. Pers.); Sourenjane metri (Schl.).

Ph. Pers.; Boiss. v. 167; Schl.; Ait.; Ph. Ind. iii. 496.

This plant, allied to the *Colchicum*, occurs in North Persia, Afghanistan, the Juniper tracts of Baluchistan, and in the Punjab.

Aitchison found the plant common all over the Badghis and Khorasan. The corms are collected and exported from Meshed, as a medicine, through Persia to India *via* the Persian Gulf. The drug is one of the forms of the ancient Hermodactyl. It is probably the Surinjan-i-shirin or Sweet Surinjan, a medicine used by the Mohammedans in India.

The root from Hamadan is broken up into pieces showing a white, starchy fracture with no perceptible taste or smell. The starch granules are oval or rounded, occasionally truncate, with a hilum.

The drug is said to have the same action as the bitter Surinjan (*Colchicum* spp.) as a remedy for rheumatism.

Morus nigra *Linn.* (Moraceae). The root-bark.

Risha sha tut (Teheran); Chah touti (Schl.); Shah tut, "Royal Mulberry"; Tut shami (Syr.); Moron (Gr.); Sycamine.

The Black or Grafted Mulberry is cultivated in Persia and Baluchistan, principally for its fruit; the White Mulberry (*M. alba*) is grown for sericulture. They both yield fruit which in season is sold in the bazaars and met with in nearly every household (Aitchison).

The drug from Teheran consists of the bark of the root, reddish-coloured externally, with strong silky-white liber cells. It is used for dysmenorrhoea. In China the root-bark of the White Mulberry also has a great reputation as a medicine.

Nepeta ispahanica *Boiss.* (Labiatae). Flowers.

Zūfā (Teheran); Zufah-i-yabis (Pers.).

Boiss. iv. 166; Achundow; Ph. Ind. iii. 116.

Zufah is a fragrant plant used for many years as a drug in the East. Schlimmer refers to Zoufa as a Hyssop and identifies the plant as *Nepeta officinalis*. Aitchison doubtfully refers the Zufa of Afghanistan to a species of *Hyssopus*. Dr. Dymock found the Zufah in Sind to be *N. ciliaris* Benth., while the plant of this name in Baluchistan is *N. bracteata* Benth. (I.H.B.).

The drug from Teheran consists of the fruiting calyx and seeds and stalks of *N. ispahanica*, a species allied to *N. schiraziana* Boiss. The calyx is erect, 5 mm. long, 15-ribbed, green, with purplish, lanceolate, acute teeth, nearly as long as the tube. The seeds are oblong, 1 mm. in length, minutely punctate, with a white V-shaped scar at the narrow end. The seeds are mucilaginous when placed in water.

Nigella sativa *Sibthorp* (Ranunculaceae). The seeds.

Siyah danah, Shuniz (Pers.); Hab-es-souda (Arab.); Kala jira (Hind.); Siah daneh, Chounige (Schl.); False Cummin.

Boiss. i. 68; Ph. Ind. i. 28.

An annual herb, sometimes called the Nutmeg flower or Fennel flower, cultivated in Egypt, Syria, and Persia. According to Birdwood the seeds of the plant are the Black Cummin of the Bible, the Melanthion of Hippocrates and Dioscorides, and the Gith of Pliny.

The seeds are triangular, 2·5 to 3 mm. long, the umbilical end being the smaller, black; the testa is rough, with a white, oily kernel within. When crushed there is a pleasant odour of lemon. The seeds have been analysed by H. G. Greenish (Pharm. Journ. [3] x. 909), who found an essential oil, a fixed oil, and a saponin-like body. The seeds are used extensively as a spice and medicine. The ancient custom of sprinkling the seeds, like those of cummin, over the surface of bread baked by Mohammedans still prevails in Teheran and Tabriz. There is an Arab proverb: "In the black seed is the medicine for every disease except death." Around

Tabriz *N. arvensis* Linn. is cultivated as a pot-herb and for its seeds. It is called Gara tschorek oti, " Black bread weed " (Gilliat-Smith).

Nymphaea alba *Linn.* (Nymphaeaceae). The flowers.

Nilafar (Teheran) ; Nīlufar (Pers.) ; Nenuphar (Ph. Pers.).

Ait. ; Boiss. i. 104 ; Fl. Br. Ind. i. 114 ; Ph. Ind. i. 70.

These are the flowers of the White Water Lily found in ponds throughout Europe and Siberia. Nilufar is a name also applied to flowers of other water-lilies and sometimes to species of *Ipomoea*, which have blue flowers. Kamal, the flowers of a *Nymphaea*, is sold in drug-shops in India ; and occasionally the flowers of the Sacred or Egyptian Lotus (*Nelumbium speciosum* Linn.) are used medicinally, especially in China.

The flowers have cooling and astringent properties and are administered locally for fevers and chest troubles (C).

Ochrocarpus longifolius *Benth. & Hook.* (Guttiferae). The buds.

Normush (Hamadan) ; Tambra, " red," Nagkeshur (Pers.).

Fl. Br. Ind. i. 270 ; Ph. Ind. i. 172.

This tree grows in the western part of the Peninsula of India from Canara to the Concan. The flower buds come principally from Rajapur and the Deccan.

The reddish-brown globose flower buds, like cloves, are used for dyeing silk and are astringent. In Persia, where they seem to have been recently introduced, they are used as a tonic (C).

Ocimum Basilicum *Linn.* (Labiatae). The seeds.

Tukhm-i-raihan (Hamadan) ; Reyhane sibze (Schl.) ; Takmeria (Bomb.) ; Semen Basilici (Old Herbals) ; Alfabaca (Port.).

Ait. ; Boiss. iv. 534 ; Fl. Br. Ind. iv. ; Ph. Ind. iii. 83.

The Sweet, Roman, or Garden Basil is a native of India and Persia and is distributed in Africa and Malaya. Raihan is Arabic for " the herb," and the plant is a pot-herb much used for its mint-like aroma. The seeds have long been known in medicine, and are said to be the Badranj of Ibn Sina. Large quantities are imported into India from Persia.

The nutlets or seeds are blackish, oblong, 2 to 2·5 mm. long by 1 to 1·2 mm. broad, punctulate, slightly arched on one side, with a white umbilicus at the end. They immediately become coated with a semi-opaque mucilage when placed in water.

Schlimmer remarks that the seeds are eaten with bread and cheese.

Ocimum canum *Sims* (*O. album* Roxb.). (Labiatae). The seeds.

Tukhm-i-sherbati (Hamadan) ; Tukhm-chirbati, reyhane kouhi, Badroudge ibieze (Schl.) ; White Basil.

Schlimmer remarks that Shiraz supplies Persia with these seeds, and adds that they are an indispensable ingredient in iced sherbert (sorbets à la glacé). It is said that when placed in water they give

off an agreeable odour, thus differing from the seeds of species of plantain (*Plantago*).

The seeds or nuts are black, punctulate, oblong or ellipsoid, 2 by 1 mm., arched on one side with a sharp bifurcate line on the other. They are smaller than those of *O. Basilicum*, with a less prominent white umbilicus, but, like them, they become coated with opalescent mucilage when placed in water.

The seeds are given locally for lung and chest complaints.

Onosma echioides *Linn.* (Boraginaceae). The root.

Risha hava chuba (Hamadan); Haveh tchoubeh (Schl.); Harjuya (Pers.); Ratanjot (Hind.); Yarling (Bal.).

Achundow; Schl.; Boiss. iv. 181; Fl. Br. Ind. iv. 178; I.H.B.; Ph. Ind. ii. 54.

This plant, growing in Afghanistan and Siberia, affords a root which is a substitute for Alkanet (*Anchusa tinctoria*), from Al-kanna of the Arabs, employed as a dye and medicine in early times. The root of the allied species, *O. Hookeri* Clarke, is called Ranj-i-badshah, "King's dye." The tapering root has a purplish-red colour, and the cortical portion is easily separated in flakes. It imparts its colour to oils and spirits, and is used in colouring medicinal preparations. In Baluchistan the powdered leaves are given as a purgative to children. In Hamadan the root is powdered and given to horses for cough.

Papaver somniferum *Linn.* (Papaveraceae). The seeds.

Tukhm-i-khash-khash (Hamadan); Khish khash (Arab.); Kheche-kheche (Schl.); Poppy seeds.

Aitchison; Post; Ph. Ind. i. 73.

The seeds of the Opium Poppy are eaten in sweetmeats. They contain 50 per cent. of drying oil which is sometimes expressed and called Roghan-i-khash-khash. This oil is used for burning as well as for food. The seeds are sometimes said to be poisonous because they are contained in the opium-yielding capsule, but they are wholesome and nutritious.

Peganum Harmala *Linn.* (Rutaceae). The seeds.

Harmall (Arab.); Ispand, sipand (Pers.); Uzarih (Turki); Kharjil, haremlan (Syr.); Espende, sodabe kouhi (Schl.); the Syrian Rue.

Achundow; Schl.; Post; Boiss. i. 917; Fl. Br. Ind. i. 486; Ph. Ind. i. 75; Wiesner, 44.

The Mountain Rue is a plant of Persia, Arabia, Syria, North Africa, and South Europe. The plant and seeds were used medicinally by the Greeks and Romans. Harmel or wild rue, a native of Eastern countries, was noticed in European Herbals in the XVIIth century. The seeds are imported from Persia into India, where the plant has been introduced by the Mohammedans. The seeds are dull grey-brown, 2 mm. long, irregularly angular, testa spongy and rough, albumen fleshy, embryo curved; they have a bitter taste,

and when crushed have a heavy narcotic odour. They afford a fluorescent solution in water and a red-coloured tincture in spirit. The active principle probably resides in the alkaloids harmaline (Göbel, 1837) and harmine (Fritszche, 1847). The custom still prevails in Persia of sprinkling the seeds on burning coals at marriages to avert the malignant influence of the evil eye. The seeds are an alterative and purifying medicine, and are supposed to stimulate the sexual system.

Physalis Alkekengi *Linn.* (Solanaceae). The fruits.

Gul-i-kakandj (Hamadan); Kakanah (Pers.); Kekenadge (Schl.); Alkikenji (Arab.); Clammy Wintercherry.

Achundow; Boiss. iv. 287; Post; Ait.; Schl.; Ph. Pers.; Ph. Ind. ii. 560.

A plant of Syria, Arabia, Persia, and Baluchistan.

The berries of this plant are in shape and size like dried cherries, but are full of pulp in which are embedded many reniform, yellowish seeds. As sold in the bazaars, broken fragments of the red accrescent calyces are mixed with the drug.

The fruits are said by Schlimmer to be hydragogue and vermifuge. Achundow indicates their use in certain female complaints. Locally they are regarded as a remedy for syphilis, and are supposed to be intoxicating when taken in quantity (C).

Pimpinella Anisum *Linn.* (Umbelliferae). The fruits.

Bādian-i-rūmī (Teheran); Antchibun, a corruption of Anisum (Tabriz); Erva dos, from Portuguese Herba doce (Dymock); Aniseed.

Ait.; Boiss. ii. 866; Schl.; Ph. Ind. i. 131.

Anise is cultivated largely in Russia, as well as in Persia, for its seed, which is employed as a condiment and medicine. The fruit is often confounded with fennel. Boissier and Pomet give the Arabic Badyan as the vernacular name of *Foeniculum officinale* All. and the sample from Hamadan, labelled Badian, is the fruit of *Foeniculum vulgare*. Aniseed has been introduced into India from Persia, whence the supply for the Bombay market still comes. It is mainly a Mohammedan medicine, and is given in cough mixtures and to relieve pain. Arak-badiane or Anise water prepared by distillation is mentioned by Schlimmer. In Teheran the seeds are regarded as slightly poisonous. The active principle resides in an essential oil consisting of 80 to 90 per cent. of solid anethol which separates out slightly below ordinary temperatures, and anisic methyl charvicol.

Pistacia Khinjuk *Stocks.* (Anacardiaceae). The galls.

Buzghanj (Hamadan); Ushgai, bazgai (Bal.); Gul-i-pista (Bom.); Kakra-singh; Afs or Afs-el-batum (Tripoli).

Ait.; Boiss. ii. 6; I.H.B.; Ph. Ind. i. 377.

This is a frequent tree in Persia, Baluchistan, and Afghanistan, and has been described under different species. The tree yields a

resin-like material, and the nuts, which are eaten, afford a sweet oil; the leaves and galls are employed for tanning.

The galls are formed by an insect *Pemphigus utricularius* Pass. (figured in "Les Zoöcécidies des Plantes d'Afrique, d'Asie et d'Océanie," by C. Houard, 1923, figs. 1010-1012, p. 471, under *P. atlantica* No. 1731). The galls, which contain about 40 per cent. of gallotannic acid, are ovoid, larger than peas, sometimes fig-shaped, at first pink in colour turning grey; the wall is thin, brittle, rugose on the outside, smooth within, translucent. The taste is astringent and slightly terebinthinate. In Persian and Arabic works on medicine these galls are described as cold, dry and astringent. Besides the galls of the Khinjuk tree the fruits of various species of *Pistacia* are used as food. Laufer in Sino-Iranica remarks that these indigenous trees from ancient times have occupied a prominent place in the life of the Iranians. The youth of Persia have been taught to subsist on terebinths, and "terebinth eaters" became a nick-name. The seeds of the Pistachio nut tree (*P. vera* Linn.) are probably the terebinths referred to, but other species and varieties also afford edible fruits.

In the present collection two samples of fruits are included.

Sample one: Habul-kazra (Teheran), Habb-el-khazra (Pers.). Schlimmer identifies Hebbil el Khezra as the seeds of the Persian Turpentine tree (*P. acuminata* Boiss. ex Buhse, now a synonym of *P. Khinjuk* Stocks). These small seed-like fruits are oval in shape, 6 mm. long, reddish-brown in colour, with an acid taste and terebinthinate odour. They resemble fruits on botanical specimens of *P. mutica* F. & M., a tree of Egypt, Asia Minor, Persia, and Afghanistan. The fruits are eaten, and are said to be good for debility.

The second specimen, from Hamadan, is called Chaltangach (Chatlanguch). These are small drupes, broader than long, 5 by 6 mm., rounder than the previous sample, glabrous, rugose, grey with bony stone. They resemble the fruits of *P. integerrima* Stew. (Fl. Br. Ind. ii. 13), the North-western Himalayan form of the Turpentine tree. They have a marked terebinthinate odour. They are used locally to impart flavour to milk.

In Baluchistan, the fruits, "Shahna," of the Khinjuk tree are dried and made into flour and eaten by the poor (I.H.B.).

Plantago major *Linn.* (Plantaginaceae). The seeds.

Bareng (Teheran); Tukhm-bārhang (Hamadan); Bartang, barhang (Afgh.); Bar-i-tang (Bal.).

Achundow; Ait.; Schl.; Boiss. iv. 878; Post 668; Ph. Ind. iii. 128; I.H.B.; Gilliat-Smith.

The Greater Plantain is very widely distributed in temperate countries. The seeds of this and other species are largely employed in medicine in the East. In Tabriz this plant is called in Turki Bizousha dishi, the female kind. *P. lanceolata* L. is distinguished as Bizousha erkek, the male kind.

The seeds are small, oval, 1 mm. long by 0·5 mm. broad, smooth and brown. They throw off a transparent mucilaginous coating when placed in water.

On account of their mucilaginous properties the seeds have a great reputation for affections of the bowels and as a remedy for dysentery. They are used locally as a chest medicine (C).

The seeds of *P. Loefflingii* Linn. are sold in the bazaars in Tabriz, where they are called in Turki Karni Yarikh, meaning " healing of the stomach " (Gilliat-Smith).

Plantago ovata *Forsk.* (*P. Ispaghula* Roxb.). (Plantaginaceae). The seeds.

Asbarg (Teheran) ; Asparse, asbaghul, ispaghul (Pers.) ; Lisan ul hamal (Arab.) ; Psyllii semina (Ph. Pers.) ; Khardanick (Bal.). Achundow ; Schl. ; Boiss. iv. 855 ; I.H.B. ; Ph. Ind. iii. 126 ; Brit. Phar. 1914.

This species of Plantain is a native of Persia, Baluchistan, and Northern India. Stocks observed that it was specially grown in Sind for its mucilaginous seeds, which from the time of Dioscorides have been a well-known medicine in the East. Large quantities are imported into Bombay from Persia. These seeds are light-coloured, boat-shaped, pointed at both ends, 2 mm. in length, translucent, with a pinkish tinge and brown streak on the convex side ; the concavity is covered with a thin white membrane. They become coated with mucilage when soaked in water.

An infusion of the seeds is given to quench thirst and relieve cough. The crushed seeds, made into a poultice with vinegar and oil, are applied to gouty and rheumatic swellings.

In Baluchistan the seeds of *P. ciliata* Desf. are also called Isbaghol, and are used as a cure for dysentery (Hughes-Buller).

Plumbago sp. (?). (Plumbaginaceae). The root.

Risha tamesh (Teheran) ; Shitaraj, Chitrak (Hind.).

This root is not identified with certainty, but agrees outwardly with museum samples of plumbago root, of which two kinds are known in the East ; Indian and Syrian. The root is $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter, dark reddish-brown, longitudinally striated, and marked here and there by warty projections. The taste is acrid and biting. Its medicinal uses in Persia are not specified, but in India it is considered a powerful sudorific.

Poisons.

The following are regarded in Persia as poisonous drugs.

Aristolochia longa	Root	(Teheran).
Croton Tiglium	Seeds	(Hamadan).
Datura Stramonium	Seeds	(Hamadan & Teheran).
Datura Stramonium	Leaves	(Hamadan).
Doronicum Pardalianches	Root	(Hamadan).
Gypsophila paniculata	Root	(Hamadan).
Hyoscyamus reticulatus	Seeds	(Hamadan).

Ipomoea hederacea	Seeds	(Hamadan).
Iris spuria	Rhizome	(Hamadan).
Onosma echioides	Root	(Hamadan).
Ricinus communis	Seeds	(Hamadan).
Strychnos Nux-vomica	Seeds	(Teheran).
Veratrum album L.	Rhizome	(Hamadan).
Withania somnifera	Root	(Hamadan).

Polygonum sp. (Polygonaceae). The rhizome.

Risha-anjubar (Teheran) ; Anjubar-i-rumi (Pers.) ; Endjebar (Schl.) ; Bistort is the Anjubar of the Western Arabs.

Ait. ; Post ; Schl. ; Boiss. iv. 1027 ; Ph. Ind. iii. 150.

The rhizome sent under this name is nearly cylindrical, about 15 mm. thick, twisted, with rootlets below and scars above, reddish-brown and wrinkled on the outside, whitish within, with a ring of vascular bundles between the centre and circumference. The root contains tannin and grains of starch, elongate-oval in shape. The drug sold in Teheran came from Kermandshah and is probably intended to represent bistort, the rhizome of *P. Bistorta* Linn., but it differs from authentic museum samples of this drug. Schlimmer states that bistort root comes to Persia from Russia via Astrachan. Dymock informs us that the root of *P. vivipara* is a substitute for bistort in the Punjab, and the root Anjubar-i-rumi, not true bistort, and probably the root under notice, is imported into India from Persia. The root being very astringent is prescribed in cases of diarrhoea and dysentery.

Punica Granatum *Linn.* (Lythraceae). The flowers.

Gul a-nar (Teheran) ; Gul nare-farei (Schl.) ; Flores Punicae-granati (Ph. Pers.) ; Pomegranate flowers.

Achundow ; Ait. ; Post ; I.H.B. ; Fl. Br. Ind. ii. 581 ; Ph. Ind. ii. 45 ; Boiss. ii. 736.

The Pomegranate is a favourite tree in the East, where it is cultivated for its handsome flowers and edible and refreshing fruit, both of which are medicinal. It is indigenous in Anar-dara, Baluchistan, and eastward along the Suliman range to the Kuram Valley, into Kashmir and Kumaon. The fruit is the Malus punicus of the ancients, Balusitan of Persia and Arabia, and Anar of Baluchistan. In the trade the small Pomegranates are anar-dana, whereas the cultivated fruit is anar. They are exported in immense quantities to Afghanistan and India. The rind of the fruit is used for dyeing and tanning leather. The ancient Persians were acquainted with the taenifuge qualities of the root-bark. The dried red flowers are given in pyorrhoea and whooping cough (C).

Pyrethrum sp. (?). (Compositae). Root.

Katek bah (Teheran).

This drug consists of a tapering root with a few undeveloped leaves arising from the crown. The root has the characters of that

of a composite, and the leaves resemble those of a *Pyrethrum*. The sample is marked " Poison—used as an eye medicine."

Quercus spp. (Cupuliferae). The galls.

Giash mashi (Hamadan); Kisa, kesa (galls); Maju, mazu, marjun (Pers.).

Pharmacographia; Galls figured in Connold's British Oak Galls; Houard 375; Ait.; Ph. Ind. iii. 360.

On the oaks growing in Asia Minor, Syria, and Turkey a quantity of galls are produced which reach India *via* the Persian Gulf. In North-eastern Persia, where oaks do not occur, the galls are imported from other districts of Persia for dyeing and tanning.

The galls in the collection are produced by the insect *Andricus lucidus* Hartig., var. *orientalis* Trotter. This Cynipid makes galls on *Quercus robur* Linn., *Q. lusitanica* Lam. and *Q. mongolica* Fisch. The galls are found in Britain in March and April, but are rare. The bazaar specimens are probably brought from Asia Minor. The galls have long spines, which, however, are broken off in the bazaar sample from Hamadan. The galls are usually used by tanners and are sold in drug shops as an astringent medicine. The local drug is given as a febrifuge (C).

Quercus spp. (Cupuliferae). The saccharine secretion.

Pune (Teheran).

Under this name is supplied a confection or cake of sugary substance, green with the presence of broken leaves. It is considered to be a form of Tar-anjabin " green honey," or Gaz-anjabin " Tamarisk-honey." Layard referred to this substance in his " Early Adventures in Persia, Vol. i. p. 349." " The mountainous country beyond Fellaut is thickly wooded with the 'beloot' or oak. These trees are chiefly valuable for the white substance called by the Bakhtyaris 'gaz' or 'gazu,' a kind of manna. It is an article of export to all parts of Persia, and is everywhere sold in the bazaars, and employed in the manufacture of a sweetmeat called 'Gaz-enjubeen,' which is much relished and considered very wholesome. When boiled with the leaves and allowed to harden it forms a kind of greenish cake, not disagreeable to the taste, but prepared for the use of the ladies of the enderun and to be offered to guests, it is carefully skimmed and separated when it becomes a white paste of very delicate flavour." Dr. Aitchison remarks that the name Tar-anjabin would apply correctly to Layard's " greenish cake." The names Tiringibyn and Terendschabin are quoted by Ibn Baitar, Garcia da Orta, and Schlimmer, and in the Pharmacopoeia Persica as those of an important purgative in Persia, and have been referred to the product of the Camel-thorn (*Alhagi camelorum* Fisch. and *A. maurorum* Desv.). But the name, in all probability, has been transferred in other districts to other sources. The broken leaves embedded in the green cake called Pune are not those of an *Alhagi* or *Cotoneaster*, but are more like those of an oak. Oak manna, manna

quercina, Gueza-elefi of Schlimmer, has been obtained from the leaves and fruits of *Q. mannifera* Lindl. of Kurdistan, *Q. persica* Jaub. & Spach, *Q. tauricola* Kotsch. and *Q. valonea* Kotsch. According to Tschirch (Pharmacologie) and Wehmer (Pflanzenstoffe) saccharose, glucose, fructose, and mucilage, in varying proportions, have been separated from these secretions. Ebert (1909) showed that a sample of Taranjabin contained saccharose and no glucose. Manna of the Oak from Smyrna (Hanbury, Sci. Papers 287), found on the leaves of the dwarf oaks, is collected by the peasants, who use it instead of butter in cooking their food, and ascribe to it no purgative effect while it is fresh.

Rheum Ribes *Gronov.* (Polygonaceae). The plant and fruits.

Riwas, ribas (Teheran); Tukhm-i-riwas (Hamadan); Ribas, the Persian and Arabic name of the plant; Rhubarb fruits.

Boiss. iv. 1003; Ph. Ind. iii. 153.

The edible rhubarb is indigenous all over the moister localities from 3000 feet and upwards, occurring in great expanses on a northern exposure, on the Pawpamissus range, and the higher hills of Khorasan, marking the country most characteristically in the autumn with the brilliancy of its almost scarlet foliage. The fruit and rootstock of wild rhubarb are both collected to be employed in medicine. A decoction of the fruit is considered a more powerful purgative than that of the root-stock (Aitchison).

The fruits of this plant, sold in Teheran, are used as a vermifuge for horses. Also in Hamadan the drug is applied as a poultice for pain in the head and ears (C).

Rhus coriaria *Linn.* (Anacardiaceae). The fruits.

Sumagh (Teheran); Summaq (Pers.); Tartak (Hind.).

Achundow; Schl.; Boiss. ii. 4; Post; Ait.; Ph. Ind. i. 373.

The Sumach is a tree cultivated in Khorasan, Western Afghanistan, and throughout Central Asia.

The leaves have long been used by the Arabs, Turks, and Persians, and in Europe, for dyeing and tanning leather and silk. They contain from 15 to 33 per cent. of tannin.

The fruit is exported from Persia and used by Mohammedans in India. The fruit is a small drupe, the size of a lentil, 5 mm. in diameter, red-coloured, acid and astringent to the taste, containing one lenticular, polished, brown, oily seed. These fruits are eaten and are reckoned as astringent in dysentery.

Ricinus communis *Linn.* (Euphorbiaceae). The seeds.

Kercheng (Hamadan); Karchak, garchak (Pers.); Tochme kertchec (Schl.); Khurwa (Arab.); Bed-anjir "Willow-fig"; Castor-oil seeds.

The Castor Oil plant is cultivated, round the margin of cotton, tobacco, or melon fields, throughout the country for its seed, from which the chief oil for burning is obtained. Aitchison noticed that

neither the seed nor the locally pressed oil is used in medicine, only the imported ' cold drawn ' oil is so used.

The above name for the seeds is probably derived from Kirchek in the Deilami language because the fruit is like a basket with a cover made out of date leaves (Ph. Ind. iii. 301).

Roccella Montagnei *Bél.* (Graphidaceae). The lichen.

Dowalah (Hamadan) ; Davāla, Dāvila (Pers.).

Achundow refers this drug to *Muscus arboreus*, and gives the Persian names as Dawalak and Karbasu and the Arabic name as Aschna (*Usnea* sp.). The Persian name Dowalah is applied to more than one kind of lichen, since Dymock gives *Parmelia Kamtschadalis* Esch. as the source of Dowalah of the Indian bazaars (Ph. Ind. iii. 627). Some of the Parmelias are used as a dye, but the above drug from Hamadan gives no coloration with caustic potash. It is a whitish or grey coloured lichen in broken pieces. It has emollient and astringent properties, and is used in a bath or as a poultice. Locally it is given for stomach troubles (C).

Rosa foetida *Herm.* (*R. lutea* Mill.). (Rosaceae). The flowers.

Gul-i-zard, " yellow flower " (Teheran) ; Gole zarde (Schl.).

A. Olivier (Voyage dans l'Empire Ottoman, l'egypt et la Perse, Paris, 1807) ; Boiss. ii. 671.

The Persian Yellow Rose is a cultivated shrub in gardens. This is the yellow Austrian Briar in a wild state extending from the Crimea and Asia Minor through Persia to Turkestan, Afghanistan, Punjab, to Eastern Tibet. Aitchison calls it the Gul-i-raman-zeba, " lovely flower," of the Hari rud Valley.

The flowers are given in colic and for diarrhoea. Gulangabin is a confection of rose petals made with honey.

Rosa hemisphaerica *Herm.* (*R. sulphurea* Ait.). (Rosaceae). The fruits.

Damaverah (Hamadan).

Ph. Ind. i. 574 ; Boiss. ii. 672 ; Post.

This rose occurs in Persia and Afghanistan and, according to Post, is extensively cultivated in Syria.

The drug consists of the hips of this species. They are erect, nearly globular, broader than long, from 10 by 7 mm. to 13 by 8 mm., crowned with the remains of sepals, red, wrinkled, with short protuberances outside. Within are several light brown, hard, smooth seeds, 4 mm. long, mixed with silky hairs. The fruits are hot, dry, and astringent ; they are given for stomach complaints.

Under the name of Ward, roses are found in Arabic and Persian works. In India the fruit of *R. canina*, as a medicine, is referred to as Dalik or Dog Rose (Dymock).

Rubia tinctorum *Linn.* (Rubiaceae). The root.

Runas (Pers.) ; Rounace (Schl.) ; Fuwwah (Arab.) ; Munjit (Hind.) ; Madder.

Ait. ; Boiss. iii. 17 ; Post 224 ; Schl. ; Ph. Ind.

The Madder plant grows from Persia to Spain. Aitchison says it is cultivated throughout the country in East Persia and takes three years for the proper size of the root to form. It is largely grown at Anar-dara, Koin, and Yezd, whence the root is exported in quantity to Herat. From Herat it is re-exported in all directions to Afghanistan proper and India, besides, in some bulk, to Turkestan. It affords a well known red dye for carpets. The root is used as a dye-stuff and a drug throughout the East.

Rumex obtusifolius *Linn.* and **R. conglomeratus** *Linn.* (Polygonaceae). The fruits.

Tukhm-i-hammāz (Teheran and Hamadan).

Boiss. iv. 1010 ; Ait. ; Post ; Ph. Ind. iii. 158.

The first of these widely-distributed species of dock yields a medicinal root known to the ancients as Radix Lapathi. But in Persia and India this and other species afford medicinal fruits. Those from Teheran belong to *R. obtusifolius* ; they have three wings, are net-veined, irregularly toothed, and are red and green coloured. They are used locally as a stomachic.

The fruits from Hamadan are from *R. conglomeratus*, and have shorter wings, not distinctly toothed. They are given in pyorrhoea.

The drug under this name, however, is not confined to these two species of *Rumex*. According to Dymock Gul-i-hamaz or " Dock flowers," in India, are afforded by the fruits of *R. vesicarius* Linn., a plant found all over Asia.

Salvia Hydrangea *DC.* (Labiatae). The flowers.

Gula arbore (Teheran) ; Gul-i-arba (Pers.) ; Issikuttuz (Turki) ; Sarsand (Bal.).

Boiss. iv. 606 ; Ph. Ind. iii. 94 ; Kew Bull. 1930, 459.

A handsome flowering plant of Persia, Baluchistan, and Afghanistan. The drug consists of the mauve flowers with green-veined bracts, and small, rounded, brown seeds. Dymock says this drug is allied to Jadeh, probably a *Teucrium*. The flowering tops of a *Moluccella*, having enlarged purple calyces and a balm-like odour, and the rose-coloured mucilaginous calyces of *Hymenocrater elegans* Br. are used in medicine in Persia under the name of Gul-i-serwaj.

In Tabriz the inflorescence of *S. Hydrangea* is used in making medicinal tea (Gilliat-Smith). In Teheran the drug is said to stop excessive menstruation.

Salvia sp. (Labiatae). The seeds.

Tukhm-i-khardal (Hamadan).

Tukhm-i-khardal is the Persian name for mustard seed, but here the seeds of a *Salvia* have been supplied. The seeds are rounded, 1 mm. in diameter, greyish-brown, smooth, with a minute round umbilicus ; a transparent mucilaginous coating is formed when the seeds are soaked in water. Aitchison, Schlimmer, and Dymock refer to species of *Salvia* being used in medicine under the name of

Kanocha. Dr. Stapf has shown that the Kanocha seeds of Ispahan, sold in the shops under the Persian name of Marv, are those of *S. macrosiphon* Boiss. (Ph. Ind. Appendix). The seeds are used locally, as mustard seeds, for making poultices. Those of *S. duplicifolia* Benth., called Maur in Baluchistan, are used for the cure of eye diseases.

Saussurea Lappa *C. B. Clarke* (Compositae). The root.

Butenak (Teheran); Patchak (Beng.); Kushta (Sans.); Kut (Hind.); Khost, Kust-i-talk, Bughenagh (Pers.); Costum amarum (Ph. Pers.); Indian Costus.

Ait.; Fl. Br. Ind. iii. 376; Schl.; Ph. Ind. ii. 296.

This soft, fragrant, whitish root comes from plants grown as a crown monopoly in Kashmir, and is exported to Persia, India, and China. This ancient drug was formerly called Arabian costus, as it was carried to Turkey and Europe by Arabs. It is greatly valued as a medicine throughout the East as far as China, and being costly is often adulterated. The root occurs in cylindrical pieces about 2·5 cm. or more in diameter, light-coloured, with an agreeable odour and a bitter and biting after-taste. It contains inulin but no starch. A second sample of Khost (Kust) from Hamadan was a smaller root, spirally twisted and lighter in colour. Various chemical principles have been separated from the root, some of which account for the violet-like odour :—Costu-lactone isomeric with alantolactone costus acid, dehydrocostus lactone and costol. Costus root is prescribed externally and internally for various complaints, and is taken locally to ward off the effects of snake and animal bites (C).

Sisymbrium Sophia *Linn.* (Cruciferae). The seeds.

Towdri (Teheran).

Ait.; Schl.; Boiss. i. 216; Ph. Ind. i. 118, 121.

These seeds resemble in size, shape and colour the drug Tukhm-i-khakshir (*Erysimum* sp.), except that they are dull and not shiny. They were grown at the Royal Botanic Gardens, Kew, in order that the correct species might be identified.

There are several kinds of cruciferous seeds known as " Towdri." The white varieties are somewhat pale and light red. A brown-coloured sort is sometimes met with under the name of " Black Towdri." The seed of *Lepidium Iberis* Linn. imported into India from Persia as Kasis, is one of the seeds called Towdri. Dr. Stewart, writing on the plants of the Punjab and Sind, states that the seeds of *Matthiola incana* R. Br., the Purple Gilly Flower, constitute one of the several kinds of " Todri." The drug is aphrodisiacal, fattening the body and purifying the blood.

Smilax China *Linn.* and **S. glabra** *Roxb.* (Liliaceae). The root.

Tchoube tchini (Schl.); Chub chini (Ind. bazaars); Tu fu ling (Chin.); Raiz da China (Port.); Tuber Chinae; China root; Chinese Sarsaparilla.

Schl.; Laufer 556; Colloquios; Ph. Ind. iii. 500.

The root is a famous remedy for the treatment of Morbus americanus (Syphilis) and was first introduced into Europe by the returning sailors of Columbus, and into India by the sailors of Vasco da Gama. It is mentioned by Indian writers of the 16th century ; Garcia da Orta traced the source of the drug to China, and records a cure made in 1535. It was soon afterwards introduced into Persia by the Portuguese, and it is referred to by Mir Imad-ed-din, Mahmund of Shiraz, and Mir Muhammad Hashim, of Teheran.

Saponin has been found in the root (Kobert 1911 and 1916), but its therapeutic action is not considered very marked.

Solanum nigrum *Linn.* (Solanaceae). The fruits.

Taj-i-rizi, " the name may mean a crown of grapes or a crown of poison " (Aitchison) ; Anab etl thalib, " Fox's grapes " ; Inab-ed-Dib (Arab.) ; Karezgi (Bal.) ; Wonderberry Plant.

Achundow ; Boiss. iv. 284 ; Ph. Ind. ii. 550 ; I.H.B.

This species of *Solanum* is a common weed in Persia, where the plant is used as a vegetable, and the small black fruits with yellow seeds are medicinal. The ripe fruits are eaten in Baluchistan. The fruits of the Bittersweet (*S. Dulcamara* L.), under the name of Sag-anjar, " Dog's grapes," form a drug exported into India.

The fruits are considered laxative, and are employed in chronic enlargement of the liver.

Stachys germanica *Linn.* (Labiatae). The flowers.

Tuklejah (Hamadan).

This woolly species and its varieties are found in the Caucasus and in Europe. The drug consists chiefly of the sub-oblique calyces covered with tomentum, having five teeth, and with the remains of flowers and stalks. It is given to relieve stomach troubles.

Stachys lavandulaefolia *Vahl.* (Labiatae). The leaves.

Mardangush (Tabriz) ; Mardan-gusht, " Men's ears or fingers " ; Marzangust, Zarangust (Pers.) ; Sansaq (Arab.).

Achundow ; Ait. ; Ph. Ind. iii. ; Gilliat-Smith and Turrill, Kew Bull. 1930, 459.

This species of *Stachys* with purple flowers is found within Asia Minor, Armenia, Caucasus, Kurdistan, and Persia. The plant is one of the sources of an ancient Persian drug. Marzangust is mentioned by Abu Mansur, and is referred by Achundow to *Origanum Majorana* Linn. Dymock describes it under *Zataria multiflora* Boiss., a plant which, however, generally goes under the name of Zatar. Teheran and Hamadan bazaars afforded samples of Marzangust, one of which was a *Zataria*. Gilliat-Smith remarks that the inflorescence is sold in the bazaars of Tabriz and is made into an infusion and used locally as a remedy for spasms and stomach disorders.

Strychnos Nux-vomica *Linn.* (Loganiaceae). The seeds.

Kuchula (Teheran) ; Kachola (Pers.) ; Kotchouleh (Schl.).

Ait. ; Schl. ; Ph. Ind. ii. 459 ; Fl. Br. Ind. iv. 90.

Kuchula seeds are frequently referred to in ancient Persian works. In the Makhzan el adwiya they are said to have been used from very early times for paralysis. They are called Azaraki by Indian Mohammedans and are given for debility. The seeds are imported from India, and in Teheran, as in other parts of Persia, they are classified as a poison.

Aitchison says, " The seed of the Nux-vomica is imported freely into these parts (N.E. of Persia) as a valuable tonic, but it is chiefly employed by the nomad tribes for poisoning wolves and dogs, these animals frequently proving destructive to their flocks."

Tamarix gallica var. **mannifera** *Ehrenb.* (Tamaricaceae). The manna.

Gaz-anjabin, ' Tamarisk honey ' (Teheran) ; Gaz-i-shakar, ' Tamarisk sugar.'

Ph. Pers. ; Ait. ; Boiss. i. 778 ; Ph. Ind. i. 161.

Aitchison collected in the Badghis samples of manna from this variety of *Tamarix* which the natives distinguish from the ordinary species *T. gallica*. The saccharine exudation of this plant is said only to be collected in South-eastern Persia, in the district of Kerman, where it is obtained in large quantities and exported in all directions. In other parts of Persia Gazanjabin is obtained from other species of Tamarisk and a similar sugary substance from other plants (see under *T. pentandra*).

The sample from Teheran is a dried cake of sugar. Ehrenberg believes the sugar to be formed as a result of the punctures of *Coccus manniparus* which attacks this Tamarisk in Persia, Arabia, Afghanistan, and Egypt.

Tamarix pentandra *Pall.* (*T. Pallasii* Desv.). (Tamaricaceae). The manna.

Ghesa humase (Teheran) ; Guize khouncar, ghez mazedj, hebbel asle (Schl.).

Tamarisk manna, by D. Hooper, Journ. As. Soc. Bengal, New Series, Vol. v. 1909, 31-36 ; Boiss. i. 773.

The various species of Tamarisk are the commonest shrubs or small trees found from Quetta to Balamtghab, and from Herat to Meshed, up to 3000 ft. At least six species are widely distributed in Baluchistan, and two of them, *T. articulata* Vahl (Siahgaz) and *T. pentandra* (Shingir gaz), have been observed to yield a sweet gum. The latter is known to give a saccharine secretion in the Helmand. The samples are similar ; they are sweet, sticky, transparent secretions, quite soluble in water, and become hard and opaque when kept owing to the crystallisation of the saccharose.

Terminalia Bellerica *Roxb.* (Combretaceae). The fruits.

Balila, balile (Teheran) ; Belādu (Pers.).

Ph. Pers. ; Schl. ; Ph. Ind. ii. 5 ; Fl. Br. Ind. ii. 446.

These are the Baleric myrobalans of commerce, the Balilaj of Mohammedan writers, imported into Persia from India. They are astringent, and are made into a lotion for sore eyes.

Terminalia Chebula *Retz.* (Combretaceae). The fruits.

Halila, halile (Teheran); Halileh kabuli (Schl.); Hirada, harra, har (Hind.).

Ph. Pers.; Schl.; Fl. Br. Ind. ii. 447; Ph. Ind. ii. 1.

The ripe fruits of this tree are the Chebulic myrobalans of Indian commerce. The drug from Teheran consists of the unripe fruits of the size of raisins, said to come from Kurdistan. There are two forms of this drug known as Halileh-i-zangi and Halileh-Hindi. Myrobalans are a well known astringent and tanning agent, but in medicine they have been found to have tonic and aperient properties.

Teucrium Polium *Linn.* (Labiatae). The flowers.

Mariam mohodi, "Peas of Mary" (Teheran); Mariam nukhudi (Tabriz); Meriam mekhodi is the Teheran name for *T. scordioides* Schreb., according to Schlimmer, who gives Gole khenon as the Yezd name, and Erfieh and Erpeh as literary equivalents. The Merian gole of the Terminologie is referred to *Salvia officinalis* Linn., but according to Gilliat-Smith this plant, although cultivated in gardens in Tabriz, has no local name, and is not used by the natives.

Boiss. iv. 821; I.H.B.; Ph. Ind. iii. 125.

The plant is the Poley Germander or Polion of the Greeks. The drug consists of the small woolly flowers mixed with some stalks and leaves. It has the fragrance of thyme, and is given as an infusion for internal disorders.

In Baluchistan *Teucrium Stocksianum* Boiss. is called Kalpora, and is a remedy for fever.

Thymus Serpyllum *Linn.* var. **Kotschyanus** *Boiss.* (Labiatae). Leaves.

Joshan Shirazi (Teheran); Zata (Post); Seetere (Schl.); Djūshā (Pers.).

Ait.; Boiss. iv. 556; Post; Schl.; Fl. Br. Ind. iv. 649; Ph. Ind. iii. 114.

The habitat of this variety is Persia and Kurdistan. The leaves are rounded, cuneate, ovate to lanceolate or elliptical, with prominent nerves below. The leaves are fragrant, and resemble those of *Zataria multiflora*, a plant which also receives the name Zatar. Seetere is the name given by Schlimmer to *T. Kotschyanus*, while Post applies the Arabic name Zatar to all plants of the genus *Thymus*. Boissier on the other hand refers Zatar to *Origanum Maru* Linn., Zatar farisi to *T. capitatus* Linn., and Zaeteran to *T. decussatus* Boiss. It would thus appear that Zatar and Joshan Shirazi are similar drugs, characterised by a thyme-like aroma. The leaves are carminative. In Teheran they are given for "too much water in the stomach," probably meaning the disease called ascitis.

Trachydium Lehmanni *Benth. & Hook.* (*Malabaila Sekakul* Boiss.). (Umbelliferae). The root.

Shekakul (Pers.); Segagoul (Arab.); Chakha-khoul (Turki); Chighaghole metri (Schl.); Parsnip of the desert.

Schl.; Post, 368; Boiss. ii. 891; Ait.; Ph. Ind. ii. 136.

The roots of this and other umbelliferous plants are collected in Persia and Afghanistan, and exported to India *via* Herat as a medicine. They have the thickness of an ordinary pencil at the top of the root, and are about two inches in length, tapering very rapidly to a point. It is called "The Root of Wisdom" and "Wild Carrot root," and is considered very valuable as a diet for improving the memory and increasing brain power. The name is applied to other stimulating and nourishing roots eaten by women for improving their *embonpoint*. The roots of *Caucalis*, *Pastinaca*, *Eryngium* and *Eremodaucus* are among the drugs of this class used as food for the sickly and convalescent.

Tribulus terrestris *Linn.* (Zygophyllaceae). The fruits.

Khahasak (Teheran); Kharkhasak, khasak or hasak of the Arabs and Persians; Pakra (Hind.); Tribolia (Modern Greek).

Achundow; I.H.B.; Fl. Br. Ind. i. 423; Ph. Ind. i. 243.

This plant is found in the sandy districts of Guzerat and Kathiawar in North-western India, where the fruits are collected for the market. The drug is mentioned by Dioscorides and Pliny, and in the Bower mss., and by many Eastern writers. The fruit, of the size of a small bean, has 5 cells, dividing into 5 cocci, each of which is wedge-shaped, armed with 4 strong prickles. The seeds are oily and are enclosed in hard stony cells.

The fruits are used as a diuretic. Dr. Sayed Khan of Teheran says they act as a charm in bladder troubles. Duhn-ul-hasak and Rughan-i-char-i-chesak are names for an oil prepared from the fruits which is applied for rheumatism. In Baluchistan the plant is made into a paste with water and this is taken as a tonic and cooling medicine.

Trigonella cancellata *Desv.* var. **arcuata** *C. A. Meyer* (Leguminosae). The pods.

Iklil-il-malik (Teheran); Aketi, akentin (Hamadan); Usleib el malek (Post).

Abu Mansur; Boiss. ii. 71; Post; Ph. Ind. i. 404.

The origin of this drug has been referred to *Melilotus hamosa* Link, which has falcate pods, and *T. uncata* Boiss., whose pods are not so curved as those from Teheran and Hamadan.

The pods are horse-shoe shaped, about 2·5 cm. in length, greyish-white, curved outwards, grooved on both sides, and beaked; they are divided by a central partition and contain greyish-yellow, rhomboidal seeds, notched at one end, and with black spots.

The pods are used for various disorders, but chiefly as a suppurative and astringent. Sometimes they are made into a plaster for dispelling tumourous and painful swellings.

Trigonella Foenum-Graecum *Linn.* (Leguminosae). The herb and seeds.

Shambalila (Teheran); Tukhm-i-shambalila (Hamadan); Shamli, shamlid, shamlit (Pers.); Hilbah (Arab.); Hulbat (Ach.).

Ait.; I.H.B.; Boiss. ii. 70; Post; Ph. Ind. i. 402.

The clover, Fenugreek, is cultivated universally in gardens as a pot-herb, and occasionally, especially at Herat, as fodder for cattle. The plant grows freely round Teheran. The leaves are commonly used for poultices. The seeds are among articles of export from Karachi to Bombay. They form an ingredient in cattle foods, and are regarded as stomachic and cordial.

T. polycerata Linn. in Baluchistan is called Shimsh and is considered a wild lucerne and used as a fodder for horses and sheep.

Veratrum album *Linn.* (Liliaceae). Rhizome.

Kondush (Hamadan); Kondochi, kondoce (Schl.); Hellebore root.

Boiss. v. 171.

The White Hellebore is a plant of Europe, Central Asia, and Japan. The root is mentioned in the herbals of Hippocrates and Galen. The rhizome is dark brown, cylindrical or slightly tapering, 2·5 cm. in diameter, with numerous scars of broken rootlets; whitish within. It contains a poisonous alkaloid, jervine. The root is one of the Persian poisons.

Viola spp. (Violaceae). The flowers.

Gul-i-banafsha (Pers.).

Abu Mansur; Ph. Pers.; Ait.; Boiss. i. 450; Post, 118; Ph. Ind. i. 141.

Flowers of the Violet plant are exported from Persia to India, where they are regarded as a valuable medicine. It is not possible to identify the species of violet which constitute the dried broken flowers from Teheran. They have a diuretic and expectorant action. Dr. Sayed Khan of Teheran finds the drug to be useful in low fever where quinine is not available.

Withania somnifera *Dunal.* (Solanaceae). The root.

Busidan (Hamadan); Ashgand (Hind., Guz.); Sekran (Syr.); Hajarat el dib, " Wolf's tree " (Arab.).

Boiss. iv. 287; Fl. Br. Ind. iv. 239; I.H.B.; Post; Ph. Ind. ii. 566; Kew and Pharm. Soc. Museums.

An unarmed shrub with ovate, woolly leaves, inhabiting the South of Europe, Syria, Arabia, Baluchistan, India, and Africa. The roots are long, tapering, light brown, with knotty crowns 1·2 to 2·5 cm. in diameter, plump, smooth, white internally, with a short starchy fracture. The starch is rounded or oval with large hilum and a few granules truncated. The taste is mucilaginous and slightly bitter. From the observations made on the nature of this plant, and the specific names *somnifera* and *hypnotica* given to it by botanists, it would appear to be harmful to human beings when grown under certain conditions. In Hamadan the root is considered a poison,

and in parts of Arabia animals refuse to graze on the plant. In Baluchistan, however, it is said to be a vegetable and fodder for goats. Duthie says the shrub is alterative, and the root is given to horses. The leaves are used as a fomentation for sore eyes, and they are said to reduce boils and swellings, and to kill lice. F. B. Power and A. H. Salway (Proc. Chem. Soc. 1911, 27, 85) found evidence of an alkaloid and other crystalline principles in the root. But it contained no mydriatic alkaloid, and physiological tests failed to confirm the sedative and hypnotic properties attributed to it.

Zataria multiflora *Boiss.* (Labiatae). Leaves and stalks.

Zatar (Hamadan); Saatar (Indian bazaars); Izgun; isghand (Bal.).

Boiss. iv. 561; Post; I.H.B.; Ph. Ind. iii. 114.

This small plant is found in the hills of Muscat in Arabia, Persia, and Baluchistan. This species is allied to *Z. bracteata*, which sometimes bears the same vernacular names.

The small, thick, orbicular and glandular-dotted leaves have the odour of thymol, and are credited with the carminative properties of thyme and mint. In Baluchistan the plant is said to be good for stomach complaints.

A sample of broken stems and a few leaves labelled "marjanjust" from Teheran had the characters of this plant. (See *Stachys lavandulaefolia*).

Zizyphora tenuior *Linn.* (Labiatae). The herb.

Kakuti (Teheran); Kahkuti (Bal.).

Boiss. iv. 587; Ait.; I.H.B.; Ph. Ind. iii. 115.

A small labiate with spiked flowers found in Persia, Baluchistan, and Afghanistan. Aitchison says it is much used in medicine owing to its strong aroma of peppermint. In Baluchistan the plant is taken to allay fever, and the seeds, powdered and mixed with buttermilk, are used to cure dysentery. In Teheran the herb is employed as a cordial and stomachic.

Zizyphus vulgaris *Linn.* (Rhamnaceae). The fruits.

Annab (Teheran); Konar (Pers.); Connaros (Gr.).

Achundow; Boiss. ii. 12; Ph. Ind. i. 350; Post.

The indigenous form of the jujube is a shrub, rarely a tree, in the hills from the Badghis eastward to Kashmir. It is cultivated in all orchards for its fruit, which is largely eaten by the natives, especially on journeys, and this Dr. Aitchison thinks may account for the spread of the tree throughout the whole of Asia, wherever caravan journeys were made.

In Teheran it is said that the leaves are chewed as a drug, and the effects resemble the action of cocaine.

The fruits, which are sweet and wholesome, are the origin of the confection called the jujube. The fruits are imported into India; they are used as a demulcent and medicinally from the Persian Gulf to China.

XLVI. RESEARCHES ON SILENE MARITIMA AND S. VULGARIS: VI.* E. M. Marsden-Jones and W. B. Turrill.

Selfings of Wild Plants of S. vulgaris.

The following analyses of two generations, each obtained by selfing, under full control, one stock-plant (i.e. a plant imported directly from the wild), are of immediate interest by proving that heterozygosity within the species (i.e. varietal heterozygosity) accompanies and increases the polymorphism of the species. We are not here concerned with the possibility of hybridization giving rise to new characters, but we do show that character-combinations, similar to those met with in wild populations, can be obtained by the selfing of one wild heterozygote.

X 13. Stock Plant 10 (see *K.B.* 1931, p. 121) selfed.
139 plants.

The generation was fairly uniform with the parent for habit and leaf-shape, any exceptions being noted below. Only certain important characters are analyzed here. Since some plants did not flower and others did not set fruits and seeds it was impossible to score all of even these characters for every plant. In both this and the following generation, the first figure represents the number of the individual plant and the other symbols follow the scheme already outlined (*K.B.* 1931, pp. 136-137).

No. 1.	I.2.	K.2.5.	A.2.	G.1.3.		
No. 2.	I.1.	K.1.5.	A.2.	G.1.3.	F.1.	Se.3.
No. 3.	I.4.	K.1.5.	A.1.4.	G.2.3.		
No. 4.	I.4.					
No. 5.	I.2.	K.1.5.	A.2.	G.2.3.	F.1.	Se.3.
No. 6.	I.2.	K.1.5.	A.1.3.	G.1.4.	F.1-2.	Se.3.
No. 7.	I.4.					
No. 8.	I.4.	K.1.5.	A.2.	G.2.3.	F.2.	Se.3.
No. 9.	I.1.	K.1.5.	A.1.4.	G.2.		
No. 10.	I.4.	K.1.5.	A.1.4.	G.2.4.	F.2.	
No. 11.	I.2.	K.3.5.	A.2.	G.1.3.	F.1-2.	
No. 12.	I.2.	K.1.5.	A.1-2.4.	G.2.	F.2.	Se.3.
No. 13.	I.1.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.2.
No. 14.	I.1.	K.1.5.	A.2.	G.1.3.	F.2.	Se.4.
No. 15.	I.4.	A.1.				
No. 16.	I.1.	K.2.5.	A.2.	G.2.3.		
No. 17.	I.4.	K.2.5.	A.2.	G.1.4.	F.1.	Se.3.
No. 18.	I.4.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.4.
No. 19.	I.2.	K.1.5.	A.2.	G.2.3.	F.1.	Se.3.
No. 20.	I.4.	K.1.5.	A.2.	G.1.3.		
No. 21.	I.2.	K.2.5.	A.2.	G.2.3.	F.1.	Se.3.
No. 22.	I.3.	K.1.5.	A.2.	G.1.3.		
No. 23.	I.1.	K.1.5.	A.1.3.	G.2.3.		
No. 24.	I.2.	K.1.5.	A.1.3.	G.2.4.		
No. 25.	I.2.	K.1.5.	A.1.3.	G.1.		
No. 26.	I.1.	K.1.5.	A.2.	G.2.3.		
No. 27.	I.1.	K.1.5.	A.2.	G.1.		

* Continued from *K.B.* 1931, p. 145.

No. 28.	I.1.	K.1.5.	A.2.	G.2.4.	F.1-2.	Se.3.
No. 29.	I.1.	F.1-2.	Se.2.			
No. 30.	I.4.	K.1.5.	A.1.			
No. 31.	I.1.	K.1.5.	A.1.4.	G.2.3.		
No. 32.	I.4.	K.1.5.	A.1.3.	G.1.3.	F.2.	
No. 33.	I.3.	K.1.5.	A.2.	G.1.3.		
No. 34.	I.1.	K.1.5.	A.2.	G.2.3.		
No. 35.	I.1.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.3.
No. 36.	I.1.	K.1.5.	A.1.4.	G.2.3.	F.2.	Se.4.
No. 37.	I.1.	K.1.5.	A.2.	G.1.3.		
No 38.	I.4.	K.1.5.	A.1.3.	G.1.3.		
No. 39.	I.1.	K.1.5.	A.1.4.	G.1.4.		
No. 40.	I.2.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.3.
No. 41.	I.1.	K.1.5.	A.1.3.	G.1.3.	F.1-2.	Se.4.
No. 42.	I.2.	K.1.5.	A.2.	G.2.3.	F.1.	Se.4.
No. 43.	I.1.	K.1.5.	A.1.3.	G.2.3.	F.1-2.	Se.3.
No. 44.	I.1.	K.1.5.	A.1.4.	G.1.4.		
No. 45.	I.4.	K.1.5.	A.1.3.	G.2.3.	F.1-2.	Se.3.
No. 46.	I.1.	K.1.5.	A.1.3.	G.2.3.	F.1-2.	Se.2.
No. 47.	I.4.	K.1.5.	A.1.3.	G.2.3.	F.2.	Se.3.
No. 48.	I.2.	K.1.5.	A.1-2.4.	G.1.		
No. 49.	I.2.	K.2.5.	A.1.4.	G.2.3.	F.1.	Se.4.
No. 50.	I.2.	K.1.5.	A.1.4.	G.2.4.	F.2.	Se.2.
No. 51.	I.1.	K.1.5.	A.1.3.	G.2.3.	F.1-2.	Se.3.
No. 52.	I.2.	K.1.5.	A.1.4.	G.2.4.	F.1-2.	Se.3.
No. 53.	I.4.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.4.
No. 54.	I.2.	K.1.5.	A.1.3.	G.2.3.	F.2.	Se.3.
No. 55.	I.2.	K.2.5.	A.1.3.	G.1.3.		
No. 56.	I.1.	K.1.5.	A.2.	G.1.3.		
No. 57.	I.2.	K.1.5.	A.2.	G.1.		
No. 58.	I.2.	K.1.5.	A.2.	G.2.3.	F.1.	Se.2.
No. 59.	I.4.					
No. 60.	I.1.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.4.
No. 61.	I.2.	K.2.5.	A.2.	G.2.		
No. 62.	I.4.	K.1.5.	A.1.4.	G.2.3.	F.1.	Se.2.
No. 63.	I.1.	K.1.5.	A.2.	G.2.4.	F.1.	Se.3.
No. 64.	I.2.	K.2.5.	A.2.	G.2.		
No. 65.	I.2.	K.1.5.	A.1.3.	G.1.3.		
No. 66.	I.2.	K.1.5.	A.1.4.	G.2.4.		
No. 67.	I.2.	K.1.5.	A.2.	G.1.3.	Se.2.	
No. 68.	I.4.	K.1.5.	A.2.	G.2.3.	F.1.	Se.4.
No. 69.	I.1.	K.2.5.	A.1-2.4.	G.2.4.		
No. 70.	I.2.	K.1.5.	A.1.3.	G.2.3.	F.1.	Se.3.
No. 71.	I.1.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.3.
No. 72.	I.2.	K.1.5.	A.1.3.	G.2.3.		
No. 73.	I.2.					
No. 74.	I.4.	K.1.5.	A.1-2.4.	G.1.4.		
No. 75.	I.4.	K.1.5.	A.1.3.	G.2.		
No. 76.	I.1.	K.1.5.	A.1.3.	G.1.3.	F.1-2.	Se.3.
No. 77.	I.4.	G.3.				
No. 78.	I.4.	K.1.5.	A.1.4.	G.2.4.	F.2.	Se.3.
No. 79.	I.1.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.3.
No. 80.	I.4.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.3.
No. 81.	I.4.	F.1.				
No. 82.	I.4.	K.1.5.	A.1.4.	G.2.4.		
No. 83.	I.4.	K.1.5.	A.1.4.	G.2.3.	F.2.	Se.3.

No. 84.	I.1.	K.1.5.	A.1.4.	G.2.3.		
No. 85.	I.2.	K.1.5.	A.2.	G.2.3.		
No. 86.	I.4.	K.1.5.	A.1-2.4.	G.2.4.		
No. 87.	I.4.	K.1.5.	A.2.	G.2.4.	F.1-2.	Se.3.
No. 88.	I.2.	K.1.5.	A.1.4.	G.2.3.		
No. 89.	I.2.	K.2.5.	A.2.	G.1.		
No. 90.	I.2.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.3.
No. 91.	I.4.	K.1.5.	A.2.	G.2.3.		
No. 92.	I.4.	K.1.5.	A.1.4.	G.2.		
No. 93.	I.2.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.3.
No. 94.	I.2.	K.2.5.	A.1-2.4.	G.2.3.	F.1-2.	Se.4.
No. 95.	I.1.	K.1.5.	A.1.4.	G.2.3.	F.2.	Se.4.
No. 96.	I.4.	K.2.5.	A.2.	G.2.3.		
No. 97.	I.1.	K.1.5.	A.1.4.	G.2.	F.2.	Se.3.
No. 98.	I.4.	K.1.5.	A.1.4.	G.2.3.		
No. 99.	I.2.	K.2.5.	A.2.	G.2.3.		
No. 100.	I.1.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.3.
No. 101.	I.4.	K.1.5.	A.1.4.	G.2.4.		
No. 102.	I.1.	K.1.5.	A.1.4.	G.2.4.	Se.3.	
No. 103.	I.1.	K.1.5.	A.2.	G.2.3.	F.2.	
No. 104.	I.3.	K.2.5.	A.2.	G.2.4.		
No. 105.	I.2.	K.2.5.	A.2.	G.1.		
No. 106.	I.4.	K.1.5.	A.1.4.	G.2.	F.2.	Se.4.
No. 107.	I.2.	K.2.5.	A.2.	G.2.3.	F.1.	Se.3.
No. 108.	I.4.	K.1.5.	A.2.	G.2.4.		
No. 109.	I.4.	K.1.5.	A.1.3.	G.1.3.		
No. 110.	I.4.	K.1.5.	A.1.4.	G.2.		
No. 111.	I.1.	K.1.5.	A.2.	G.2.3.	F.2.	Se.3.
No. 112.	I.2.	K.1.5.	A.1.4.	G.2.4.		
No. 113.	I.2.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.3.
No. 114.	I.4.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.4.
No. 115.	I.2.	K.1.5.	A.1.4.	G.2.4.	F.1.	Se.4.
No. 116.	I.4.	K.1.5.	A.2.	G.2.4.	F.2.	Se.3.
No. 117.	I.4.	K.2.5.	A.2.	G.1.4.		
No. 118.	I.1.	K.1.5.	A.1.4.	G.2.4.	F.1-2.	Se.3.
No. 119.	I.1.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.4.
No. 120.	I.2.	K.1.5.	A.1.4.	G.2.3.	F.2.	Se.4.
No. 121.	I.1.	K.1.5.	A.1-2.4.	G.2.3.	F.1.	Se.3.
No. 122.	I.2.	K.1.5.	A.1.3.	G.2.3.		
No. 123.	I.1.	K.1.5.	A.1.4.	G.1.4.	F.1.	Se.3.
No. 124.	I.2.	K.1.5.	A.2.	G.1.3.	F.2.	Se.2.
No. 125.	I.2.	K.2.5.	A.2.	G.1.		
No. 126.	I.2.	K.1.5.	A.1.4.	G.1.		
No. 127.	I.4.					
No. 128.	I.2.	K.1.5.	A.1.4.	G.2.4.		
No. 129.	I.1.	K.1.5.	A.2.	G.2.3.	F.2.	Se.3.
No. 130.	I.2.	K.1.5.	A.2.	G.2.4.	F.1-2.	Se.3.
No. 131.	I.4.	K.1.5.	A.1.4.	G.2.4.	F.2.	Se.3.
No. 132.	I.1.	K.1.5.	A.1.4.	G.2.4.	F.1-2.	Se.3.
No. 133.	I.4.	K.2.5.	A.1.3.	G.2.3.		
No. 134.	I.2.	K.1.5.	A.2.	G.2.3.		
No. 135.	I.2.	K.3.5.	A.1-2.4.	G.2.3.		
No. 136.	I.4.	K.1.6.	A.1.4.	G.2.3.	F.2.	Se.3.
No. 137.	I.2.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	
No. 138.	I.2.	K.1.5.	A.1.4.	G.2.4.	F.2.	Se.3.
No. 139.	I.1.	K.1.5.	A.1.3.	G.1.3.	F.1.-2.	Se.3.

Nos. 3, 4, 15, 110, and 136 had the vegetative parts more yellow-green than those of the parent; the colour of the remainder was approximately as in the parent. Nos. 61, 65, and 99 had narrower leaves than the parent. No. 26 had very poor petals. Nos. 33 and 56 had decidedly small flowers.

Summary of Analysis.

Indumentum. Parent with medium pubescence.
On selfing gave :
Densely pubescent 43, medium pubescence 49, few hairs 3, glabrous 44.

Calyx. Parent with inflated calyx and some anthocyanin.
On selfing gave :
Inflated 109, subinflated 19, narrow 2.
All plants scorable for the character of anthocyanin, except No. 136, had some present in the calyx. No. 136 was without anthocyanin.

Androecium. Parent was fully hermaphrodite and had a faint trace of purple in the filaments.
On selfing gave :
Hermaphrodite 76, female 56.
Purplish 22, colourless 51.
7 plants, here scored as hermaphrodite, produced also a few female flowers.

Gynaeceum. Parent had white stigmata and pink immature seeds.
On selfing gave :
Purplish stigmata 39, colourless 90.
Pink immature seeds 81, colourless 32.

Fruits. Parent had intermediate fruits.
On selfing gave :
Broadly ovoid-ellipsoid 17, intermediate 33, broadly ovoid to obloid 23.

Seeds. Parent had tubercled seeds.
On selfing gave :
Armadillo 0, weak armadillo 9, tubercled 44, strongly tubercled 16.

X 12. Stock Plant 5 (see *K.B.* 1931, p. 119) selfed.
117 plants.

The generation was fairly uniform with the parent for habit and leaf-shape, any exceptions being noted below.

No. 140.	I.4.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.2.
No. 141.	I.3.	K.2.5.	A.1.4.	G.2.4.	F.1-2.	Se.3.
No. 142.	I.2.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.1.
No. 143.	I.3.	K.1.5.	A.1-2.4.	G.2.4.	F.1-2.	Se.1.
No. 144.	I.3.	K.1.5.	A.1.4.	G.2.	F.2.	Se.2.
No. 145.	I.3.	K.1.5.	A.1.4.	G.2.3.	F.1.	Se.2.
No. 146.	I.2.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.2.
No. 147.	I.4.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.2.

No. 148.	I.4.	K.1.5.	A.2.	G.2.3.	F.2.	Se.2.
No. 149.	I.3.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.3.
No. 150.	I.4.	K.1.5.	A.1-2.3.	G.1.4.	F.2.	Se.1.
No. 151.	I.4.	K.1.5.	A.1.4.	G.2.4.	F.2.	Se.1.
No. 152.	I.3.	K.1.5.	A.1.4.	G.2.4.	F.1-2.	Se.2.
No. 153.	I.3.	K.2.5.	A.2.	G.2.3.	F.1.	Se.1.
No. 154.	I.3.	K.1.5.	A.1.4.	G.2.4.	F.1.	Se.1.
No. 155.	I.4.	K.1.5.	A.1-2.4.	G.2.3.	F.1.	Se.1.
No. 156.	I.4.					
No. 157.	I.2.	K.3.5.	A.1.3.	G.1.4.	F.1.	Se.2.
No. 158.	I.4.	K.1.5.	A.2.	G.1.3.		
No. 159.	I.4.	K.1.5.	A.1-2.4.	G.1.4.	F.1-2.	Se.2.
No. 160.	I.4.	K.1.5.	A.2.	G.2.3.	F.2.	Se.1.
No. 161.	I.3.	K.1.5.	A.2.	G.2.4.	F.1-2.	Se.1.
No. 162.	I.4.					
No. 163.	I.4.					
No. 164.	I.3.	K.2.5.	A.1.3.	G.1.3.		
No. 165.	I.2.	K.2.5.	A.1-2.4.	G.2.3.	F.1.	Se.3.
No. 166.	I.4.	K.1.5.	A.1.			
No. 167.	I.4.	K.1.5.	A.1.4.	G.2.4.		
No. 168.	I.3.	K.1.5.	A.1-2.3.	G.2.3.	F.2.	Se.1.
No. 169.	I.3.	K.1.5.	A.1.3.	G.2.3.	F.1-2.	Se.2.
No. 170.	I.4.	K.1.5.	A.2.	G.2.4.		
No. 171.	I.4.	K.1.5.	A.1.4.	G.2.4.	F.1-2.	Se.1.
No. 172.	I.2.	K.1.5.	A.1.3.	G.1.4.	F.1-2.	Se.2.
No. 173.	I.4.					
No. 174.	I.4.	K.2.5.	A.2.	G.1.3.	F.1-2.	Se.1.
No. 175.	I.3.					
No. 176.	I.3.	K.1.5.	A.1-2.3.	G.1.	F.2.	Se.1.
No. 177.	I.4.	K.1.5.	A.1.4.	G.2.3.		
No. 178.	I.3.	K.1.5.	A.1.3.	G.1.3.	F.1-2.	Se.1.
No. 179.	I.4.	K.3.5.	A.1.4.	G.2.4.	F.1-2.	Se.1.
No. 180.	I.3.	K.2.5.	A.2.	G.2.4.		
No. 181.	I.4.	K.3.5.	A.1-2.4.	G.2.4.	F.1-2.	Se.2.
No. 182.	I.4.	K.1.5.	A.2.	G.2.4.	F.2.	Se.1.
No. 183.	I.3.					
No. 184.	I.3.	K.2.5.	A.1-2.4.	G.2.3.	F.1-2.	Se.1.
No. 185.	I.4.	K.1.5.	A.2.	G.2.		
No. 186.	I.3.	K.1.5.	A.1.3.	G.1.4.	F.1-2.	Se.2.
No. 187.	I.4.	K.1.5.	A.2.	G.1.3.	F.2.	Se.3.
No. 188.	I.3.	K.1.5.	A.2.	G.2.3.	F.2.	Se.3.
No. 189.	I.2.	K.2.5.	A.2.	G.1.4.		
No. 190.	I.4.	K.2.5.	A.1-2.	G.1.3.		
No. 191.	I.4.					
No. 192.	I.3.					
No. 193.	I.4.	K.2.5.	A.2.	G.1.3.	F.1-2.	Se.2.
No. 194.	I.3.	K.2.5.	A.1.3.	G.2.3.	F.1-2.	Se.2.
No. 195.	I.4.	K.2.5.	A.1.4.	G.2.3.		
No. 196.	I.4.					
No. 197.	I.4.					
No. 198.	I.4.	K.2.5.	A.1-2.4.	G.2.		
No. 199.	I.4.	K.1.5.	A.2.	G.1.3.		
No. 200.	I.4.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.1.
No. 201.	I.3.					
No. 202.	I.3.	K.2.5.	A.1-2.4.	G.2.4.	F.2.	Se.1.
No. 203.	I.4.					
No. 204.	I.4.	K.1.5.	A.2.	G.1.4.	F.2.	Se.1.

No. 205.	I.4.	G.3.				
No. 206.	I.4.					
No. 207.	I.4.	K.1.5.	A.2.	G.1.		
No. 208.	I.4.	K.1.5.	A.2.	G.1.3.	F.2.	Se.2.
No. 209.	I.4.	K.2.5.	A.1.4.	G.2.4.	F.1-2.	Se.2.
No. 210.	I.4.	K.1.5.	A.1.4.	G.2.4.	F.1-2.	Se.2.
No. 211.	I.3.	K.3.5.	A.1.3.	G.1.3.	F.1-2.	Se.1.
No. 212.	I.3.	K.1.5.	A.1.4.	G.2.3.	F.1-2.	Se.1.
No. 213.	I.4.	K.1.5.	A.2.	G.1.3.		
No. 214.	I.4.					
No. 215.	I.3.	K.1.5.	A.1.4.	G.2.4.		
No. 216.	I.4.					
No. 217.	I.2.	K.2.5.	A.1-2.3.	G.1.3.		
No. 218.	I.4.	K.1.5.	A.1-2.3.	G.1.3.	F.1-2.	Se.1.
No. 219.	I.3.	K.2.5.	A.1.4.	G.2.3.	F.1-2.	Se.3.
No. 220.	I.3.	K.2.5.	A.2.	G.1.4.	F.1-2.	Se.1.
No. 221.	I.2.	K.2.5.	A.1.3.	G.1.3.	F.1-2.	Se.2.
No. 222.	I.3.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.1.
No. 223.	I.3.	K.1.5.	A.1.3.	G.2.3.	F.2.	Se.1.
No. 224.	I.3.	K.1.5.	A.1-2.3.	G.2.3.	F.1-2.	Se.2.
No. 225.	I.4.	K.1.5.	A.2.	G.1.		
No. 226.	I.3.	K.1.5.	A.2.	G.1.3.		
No. 227.	I.4.	K.1.5.	A.2.	G.1.3.	F.2.	Se.1.
No. 228.	I.3.	K.1.5.	A.1.3.	G.2.3.	F.1-2.	Se.1.
No. 229.	I.4.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.2.
No. 230.	I.4.	K.2.5.	A.2.	G.2.3.		
No. 231.	I.4.	K.1.5.	A.2.	G.1.3.	F.2.	Se.1.
No. 232.	I.3.	K.1.5.	A.2.	G.2.3.		
No. 233.	I.4.	K.1.5.	A.2.	G.2.3.		
No. 235.	I.4.	K.1.5.	A.2.	G.1.	F.2.	
No. 236.	I.4.	K.1.5.	A.1.3.	G.1.		
No. 237.	I.4.	K.3.5.	A.1.3.	G.1.3.		
No. 238.	I.3.	K.2.5.	A.1.3.	G.1.4.		
No. 239.	I.4.	K.2.5.	A.1.3.	G.2.3.		
No. 240.	I.3.	K.1.5.	A.2.	G.2.3.	F.1-2.	Se.3.
No. 241.	I.4.					
No. 242.	I.3.	K.2.5.	A.2.	G.2.4.	F.2.	Se.1.
No. 243.	I.4.	K.1.5.	A.2.	G.2.4.		
No. 244.	I.3.	K.1.5.	A.1-2.3.	G.2.3.		
No. 245.	I.4.	K.2.5.	A.1.4.	G.2.4.	F.2.	Se.2.
No. 246.	I.3.					
No. 247.	I.3.	K.2.5.	A.1-2.3.	G.1.3.	F.1-2.	Se.1.
No. 248.	I.3.	K.2.5.	A.2.	G.1.		
No. 249.	I.3.					
No. 250.	I.3.	K.2.5.	A.2.	G.2.3.		
No. 251.	I.3.	K.1.5.	A.1.3.	G.1.4.	F.1-2.	Se.1.
No. 252.	I.3.	K.1.5.	A.1.3.	G.2.4.		
No. 253.	I.4.	K.1.5.	A.1.3.	G.2.4.	F.1-2.	Se.1.
No. 254.	I.4.	K.1.5.	A.2.	G.1.3.	F.1-2.	Se.2.
No. 255.	I.3.	K.1.5.	A.2.	G.1.4.		
No. 256.	I.3.	K.1.5.	A.1.3.	G.2.3.	F.1-2.	Se.2.

Nos. 144, 166, 172, 177, 193, 194, 203, 213, 214, 215, 217, 226, 238, 241, 244, and 248 had the vegetative parts shining green; No. 164 had the vegetative parts darker green than in the parent;

the colour of the stems and leaves of the remainder was approximately as in the parent. Nos. 141 and 183 had narrower leaves than the parent. Nos. 199, 213, 226, 232, and 234 had small flowers. No. 219 had exceptionally large petals. No. 251 had small scales (instead of bosses) on the petals.

Summary of Analysis.

Indumentum. Parent with few hairs.
On selfing gave :
Medium pubescence 8, few hairs 48, glabrous 61.

Calyx. Parent with narrow calyx and with a trace of anthocyanin.
On selfing gave :
Inflated 65, subinflated 27, narrow 6.
All plants scorable for the character of anthocyanin had some present in the calyx.

Androecium. Parent produced both hermaphrodite and female flowers, the former predominating, and had a trace of purple in the filaments :
On selfing gave :
Hermaphrodite 56, female 41.
Purplish 28, colourless 27.
17 plants here scored as hermaphrodites also produced a few female flowers.

Gynaeceum. Parent has very slightly tinged stigmata and pink immature seeds.
On selfing gave :
Purplish stigmata 39, colourless 57.
Pink immature seeds 54, colourless 33.

Fruits. Parent had intermediate fruits.
On selfing gave :
Broadly ovoid-ellipsoid 6, intermediate 40, broadly ovoid to obloid 19.

Seeds. Parent had weak armadillo seeds.
On selfing gave :
Armadillo 33, weak armadillo 24, tubercled 7, strong tubercled 0.

Conclusions.

The two generations obtained by selfing two stock-plants, of immediate wild origin, show how very heterozygous were the two parents for characters of indumentum, calyx-shape, sex, fruit-shape, and testa, and for the presence or absence of anthocyanin in filaments, stigmata, and immature seeds. This varietal heterozygosity conforms with the high polymorphism described for wild populations in our previous paper.

In view of the large amount of experimental work on *Silene vulgaris* and on *S. maritima*, to be published in later contributions, the full significance of the results obtained in the selfings X 13 and X 12 are not yet apparent and the following suggestions are in some degree tentative.

Indumentum. So far as our researches are complete all glabrous plants breed true to the glabrous character, and all densely hairy plants are homozygous for dense indumentum. In X 13 a plant with medium pubescence has, on selfing, given all four indumentum classes. A majority of plants show pubescence, and it is possible that the ratio represents a poor 1 : 2 : 1. In X 12 a plant with "few" hairs gave offspring a majority of which had few hairs and none which were densely pubescent, in this respect contrasting markedly with the results of X 13.

Calyx. Both "inflated" and "narrow" calyxed plants gave types and intermediates on selfing. We know that environmental factors (in the widest sense) modify calyx shape and at present we are doubtful what genes, if any, are involved in modifying calyx shape. In both generations anthocyanin appeared in the calyces of all plants except No. 136. If this plant lives and produces no anthocyanin in future seasons it will be tested on the hypothesis that it is a loss mutation.

Androecium. Both selfed plants had hermaphrodite flowers and both gave very close 9 hermaphrodite : 7 female ratios. Purple coloration occurred in the filaments of both selfed plants, and, in the offspring generations, plants with and plants without filament anthocyanin occurred, but in very peculiar ratios.

Gynaeceum. In X 13 a selfed parent with white stigmata gave offspring some with coloured some with uncoloured stigmata, while in X 12 a selfed parent with tinged stigmata gave similar results, and in both generations the plants with colourless stigmata largely exceeded those with coloured stigmata. Both parents had pink immature seeds and on selfing gave pink and colourless seeded plants, the latter in considerably greater numbers, and perhaps the figures are to be considered as forming poor 3 : 1 ratios.

Fruits. Both parents had intermediate types of fruits and on selfing gave ratios which may represent the 1 : 2 : 1 monohybrid ratio.

Seeds. In X 13 a plant with tubercled seeds gave no armadillo-seeded plants, but 9 whose seeds were scored as weak armadillo. In X 12 a plant with weak armadillo seeds on selfing gave armadillo and weak armadillo-seeded plants and only 7 whose seeds were scored as tubercled. It seems from our work up to the present that "armadillo" is a very clear-cut recessive character. Modifying factors probably act mainly on the tubercled type of testa, though "weak armadillo" may not always have the same genotypic constitution.

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